HSNC Board's
Smt. Chandibai Himathmal Mansukhani College
(Autonomous)
(Affiliated to the University of Mumbai)
University College Code : 217-JD Office : T14

HYDERABAD (SIND) NATIONAL COLLEGIATE BOARD

Estd. 1965

Principal : Dr. Manju Lalwani Pathak

Ref. No: CHM (A) AC/02/2026-27
Date: 27th June, 2026

CIRCULAR

The immediate attention of all concerned is invited to this Office Circular No. CHM (A) AC 11/2026 dated 19th June, 2026 regarding Choice Based and Credit Based Syllabus (CBCS), of Smt. CHM College (Autonomous), under the guidelines of University of Mumbai, as per Academic Framework of NEP 2020, for all subjects of T.Y.B.Sc in Botany SEM-V and SEM-VI.

This is in continuation with curriculum approved by Academic Council for all the subjects of F.Y.B.Sc in Botany (SEM-I), S.Y.B.Sc in Botany (SEM-III) and F.Y.B.Sc in Botany (SEM-II) & S.Y.B.Sc in Botany (SEM – IV) vide Circular Reference Numbers CHM (A) AC/C/01/2025 dated 18th June, 2025, CHM (A) AC/C/01A/2025 dated 21st July 2025 and CHM (A) AC/C/02/2025 dated 20th November, 2025 respectively.

It is hereby communicated that the recommendations of the curriculum designed by the Ad-hoc Board of studies in Botany coordinated by the Dean, Faculty of Pure Sciences in the meeting of Academic Council held on 20th June, 2026 have been approved.

In accordance, therewith, the syllabus as per the CBCS, has been brought into force with effect from the Academic Year 2026-27 for T.Y.B.Sc in Botany, in continuation with syllabus of F.Y.B.Sc in Botany and S.Y.B.Sc in Botany of 2025-2026 (updated), and accordingly the same is attached for reference and is available on the College's website www.chmcollege.in

Ulhasnagar – 421003
27th June 2026

Dr. Manju Lalwani Pathak
Principal & Chairperson, Academic Council

Copy forwarded for information to:

1. The Office of Chairperson, Academic Council
2. The Dean, Faculty of Pure Sciences
3. The Chairperson, Ad-hoc Board of Studies
4. The Controller of Examination
5. The Registrar

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College

(Autonomous)

DEPARTMENT OF BOTANY

PREAMBLE

Botany is a fundamental discipline of Life Sciences that explores the diversity, structure, function, evolution, and ecological significance of plants. Plants are essential for sustaining life as they provide oxygen, food, fuel, fiber, medicines, and other resources while maintaining ecological balance and supporting biodiversity.

The B.Sc. Botany program provides students with a strong foundation in plant sciences through theoretical knowledge, practical training, field studies, and research-based learning. It develops scientific temper, critical thinking, analytical ability, and problem-solving skills while integrating traditional botanical knowledge with modern advances in plant biology, biotechnology, ecology, genetics, and environmental science.

Aligned with the National Education Policy (NEP) 2020, the program emphasizes multidisciplinary learning, skill development, research, innovation, environmental sustainability, and ethical practices. Graduates are prepared for careers in research, agriculture, horticulture, biotechnology, pharmaceuticals, environmental management, education, entrepreneurship, and allied fields, while contributing to biodiversity conservation, sustainable resource management, and the United Nations Sustainable Development Goals (SDGs).

Faculty of Pure Sciences

Programme Outcomes

Upon completion of Bachelor of Science, learner will be able to

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PO1: **Disciplinary Knowledge:** Demonstrate comprehensive knowledge of the chosen discipline, their concepts, theories, methods, and its interdisciplinary applications

PO2: **Critical Thinking and Analytical Reasoning:** Analyse issues critically, apply logical reasoning, and develop appropriate solutions

PO3: **Problem Solving and Scientific Skills:** Apply scientific methods to investigate and solve real life problems.

PO4: **Research Competence:** Formulate research questions, design and conduct investigations, collect and interpret data, apply appropriate statistical methods and communicate research findings effectively.

PO5: **Digital literacy:** Effectively use ICT, digital resources, computational tools, bioinformatics, artificial intelligence applications, and statistical software for scientific learning, research, and decision-making.

PO6: **Communication Skills:** Communicate effectively through written reports, oral presentations, scientific publications, visual media, and interpersonal interactions with diverse audiences.

PO7: **Environmental Sustainability and Community Engagement:** Demonstrate empathy, appreciate cultural diversity, engage in community service, and promote environmental sustainability.

PO8: **Ethics and Professional Values:** Demonstrate integrity, ethical conduct, biosafety, academic honesty, respect for intellectual property, and professional responsibility in scientific practice and research.

PO9: **Leadership and Teamwork:** Work collaboratively in diverse teams, demonstrate leadership qualities, and contribute effectively to achieving common goals.

PO10: **Lifelong Education:** Engage in self-directed lifelong education for continuous personal and professional development.

PO11: **Employability and Entrepreneurship:** Apply scientific knowledge, creativity, and entrepreneurial skills for employment and entrepreneurship.

Program Outcomes (POs) for the Undergraduate Degree in Botany

The Undergraduate Program in Botany is designed to provide students with comprehensive knowledge of plant sciences through interdisciplinary, skill-oriented, and experiential learning. In alignment with the National Education Policy (NEP) 2020, the curriculum integrates traditional Indian knowledge systems with contemporary advances in plant biology, biotechnology, genetics, ecology, environmental science, and digital technologies. The program emphasizes scientific inquiry, critical thinking, research, ethical practices, innovation, entrepreneurship, and sustainable development, preparing graduates for higher education, research, employment, and responsible citizenship.

Program Specific Outcomes (PSOs) For Undergraduate Degree in Botany

Upon completion of B.Sc. Botany Program, learner will be able to:

PSO1: Apply comprehensive knowledge of plant diversity, taxonomy, evolution, morphology, anatomy, and systematics, and analyze the adaptive, ecological, and economic significance of major plant groups.

PSO2: Integrate and apply the principles of Cell Biology, Genetics, Plant Physiology, Biochemistry, Molecular Biology, and Plant Development to explain**,** analyze**,** and interpret plant growth, metabolism, reproduction, heredity, and adaptation under diverse environmental conditions.

PSO3: Analyze ecological interactions, biodiversity patterns, and environmental challenges, and evaluate conservation strategies for the sustainable management of natural resources in alignment with the Sustainable Development Goals (SDGs).

PSO4: Evaluate and integrate traditional botanical knowledge, ethnobotany, medicinal plants, and Indian Knowledge Systems (IKS) with modern scientific approaches for healthcare, biodiversity conservation, sustainable resource management, and community well-being.

PSO5: Apply botanical knowledge and laboratory techniques in agriculture, horticulture, plant biotechnology, forensic botany, plant-based industries, and entrepreneurship to solve real-world biological, environmental, and societal problems while promoting innovation and sustainable development.

PSO6: Design**,** conduct**,** analyze**,** and communicate laboratory experiments, field investigations, and research projects using scientific methods, statistical tools, digital technologies, and ethical practices to generate **and** disseminate scientific knowledge effectively.

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College

(Autonomous)

Affiliated to the University of Mumbai

First Year B.Sc. (Botany)

Paper-I

Semester- I

Title: Fundamentals of Plant Diversity, Genetics and Biotechnology

2 Credits

with effect from
the Academic Year 2026-2027

Title: Fundamentals of Plant Diversity, Genetics and Biotechnology

Course Code: CHMBOTI1

Sr. No.	Heading	Particulars
1	Description of the Course:	This course introduces students to the fundamentals of plant diversity, genetics, and modern biotechnology. It covers the structure, classification, life cycles, and economic importance of lower cryptogams The course also introduces the basic principles of Mendelian genetics, genetic engineering, plant breeding, biopharmaceuticals, and plant-derived drugs. In addition, students are exposed to emerging technologies in precision agriculture, including remote sensing, GIS, drones, and sensor-based crop monitoring systems, highlighting the role of biotechnology and digital tools in sustainable agriculture and crop improvement.
2	Vertical	1
3	Type & Teaching Methods	Theory, Inquiry-based learning
4	Credit:	2 Credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives :** **CO(A)1:** To introduce students to the diversity, structure, classification, life cycles, and economic importance of lower cryptogams including Algae, Fungi, and Bryophytes. **CO(A)2:** To develop an understanding of the fundamental principles of genetics in relation to inheritance patterns and their applications in plant science. **CO(A)3:** To familiarize students with modern biotechnological approaches such as genetic engineering, plant breeding, biopharmaceuticals, and plant-derived products.	

	CO(A)4: To create awareness about emerging technologies in agriculture, including precision farming, remote sensing, GIS, drones, and sensor-based crop management systems for sustainable agriculture.
8	**Course Outcomes (COs)**: After completion of course, Students should be able to: **CO1:** explain the structure, classification, life cycles, and economic importance of selected lower cryptogams such as *Spirogyra*, *Rhizopus*, and *Riccia*. **CO2:** analyse the basic principles of Mendelian genetics and their significance in inheritance and crop improvement. **CO3:** discuss the applications of biotechnology in plant breeding, genetic engineering, and the production of biopharmaceuticals and plant-derived drugs. **CO4:** understand the application of modern precision agriculture tools such as remote sensing, GIS, drones, and sensors used in crop monitoring and sustainable agricultural management.
9	**Syllabus** **UNIT- I: Plant Diversity: Lower cryptogams 15 L** 1. Algae – Systematic position and life cycle (excluding development stages of sex organs) of *Spirogyra*. 2. Economic Importance of Algae 3. Fungi - Systematic position and life cycle (excluding development stages of sex organs)of *Rhizopus*. 4. Economic Importance of Fungi 5. Bryophyta - Systematic position and life cycle (excluding development stages of sex organs) of *Riccia*. **UNIT–II: Genetics and Plant Biotechnology 15 L** 1. Gene Interactions and Epistasis - Introduction to Gene interaction, Allelic and non-allelic interactions, Difference between dominance and epistasis. 2. Concept of Epistasis -Definition and significance, Epistatic and Hypostatic genes, Types of Epistatic interactions - Recessive epistasis, Dominant epistasis, Duplicate recessive epistasis, Duplicate dominant epistasis

3. Genetic Engineering techniques in crop improvement.
4. Biopharmaceuticals and plant derived drugs.
5. Application of biotechnology in plant breeding.
   - Precision agriculture: Remote sensing and GIS applications in agriculture.

   Use of drones and sensors for crop monitoring and management.

Scheme of Examination and Assessment Pattern
Paper – 50 Marks
Examination: Semester End External - 30 marks Time: 1:00 hours
Format of Question Paper

Note:

1. Attempt all questions.
2. All questions carry equal marks

Sr. No.	Evaluation type	Marks	Module
Q.1.	Multiple choice Questions/ Fill in the blanks (Any five out of ten) 5 from each unit	5	1 & 2
Q2.	Answer in one -two sentences.(Any five out of ten) 5 from each unit	5	1 & 2
Q3.	Answer any one of the following (Any one out of two)	10	1
Q4.	Answer any one of the following (Any one out of two)	10	2
		Total 30	

Note

1. **Equal weightage is to be given to all the Units.**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)/ assignment.	15
2.	Attendance/*Viva Voce*	5
		Total 20

11 **Reference books:**

- Gangulee, H.C., Das, K.S. & Dutta, C. (1994). College Botany, Volume I & II (6th Edition) New Central Book Agency (P) Ltd., Calcutta.

- Vashishta, B.R., Sinha, A.K. & Kumar, A. (2005). Botany for Degree Students: Algae
- S. Chand & Company Pvt. Ltd., New Delhi.
- Vashishta, B.R., Sinha, A.K. & Kumar, A. (2002). Botany for Degree Students: Fungi S. Chand & Company Pvt. Ltd., New Delhi.
- Vashishta, B.R., Sinha, A.K. & Kumar, A. (1996). Botany for Degree Students: Bryophyta
- S. Chand & Company Pvt. Ltd., New Delhi.
- Pandey, B.P. (2001) A Textbook of Botany (4th Revised Edition). S. Chand & Company Ltd., New Delhi.
- Chawla, H.S. (2012). Introduction to Plant Biotechnology (3rd Edition). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
- Purohit, S.S. (2011). Biotechnology: Fundamentals and Applications (2nd Edition). Agrobios (India), Jodhpur.
- Acquaah, G. (2012). Principles of Plant Genetics and Breeding (2nd Edition). Wiley-Blackwell, Oxford.
- Slater, A., Scott, N.W. & Fowler, M.R. (2008). Plant Biotechnology: The Genetic Manipulation of Plants (2nd Edition). Oxford University Press, Oxford.

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College

(Autonomous)

Affiliated to the University of Mumbai

First Year B.Sc. (Botany)

Practical-I

Semester- I

Title: Practicals in Fundamentals of Plant Diversity, Genetics and Biotechnology
2 Credits

with effect from
the Academic Year 2026-2027

Title: Practical Fundamentals of Plan Diversity, Genetics and Biotechnology
(Course Code: CHMBOTI2)

Sr. No.	Heading	Particulars
1	Description of the Course:	This practical course provides hands-on training in the study of plant, fungal, and algal structures, along with basic plant reproduction and economic importance. It includes analysis of human genetic traits through pedigree studies, gene interactions using epistasis, and interpretation of human karyotypes. The course also introduces basic biostatistical methods and familiarizes students with genetically modified crops and their applications.
2	Vertical	1
3	Type & Teaching Methods	Practicum
4	Credit:	2 Credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: **CO(A)1:** To develop hands-on skills in identifying and studying the vegetative and reproductive structures of lower cryptogams such as *Spirogyra*, *Rhizopus*, and *Riccia*. **CO(A)2:** To enable students to understand basic genetic principles through practical exercises such as pedigree analysis, epistatic interactions, and karyotype studies. **CO(A)3:** To impart skills in applying basic biostatistical tools for the analysis and interpretation of biological data. **CO(A)4:** To provide basic understanding about modern biotechnological applications in agriculture through the study of genetically modified crops like Flavr Savr Tomato, Herbicide-Resistant Soybean.	

8	**Course Outcomes (COs)**: After completion of course, students should be able to: **CO1:** identify and describe the vegetative and reproductive structures of selected algae, fungi, and bryophytes using fresh or preserved materials. **CO2:** analyze human inheritance patterns using pedigree charts, epistatic gene interactions, and chromosomal (karyotype) studies. **CO3:** apply basic statistical methods such as mean, median, mode, and standard deviation for interpreting biological data. **CO4:** elaborate on applications of genetically modified crops and explain their role in modern agricultural biotechnology.
9	**Syllabus** **Practical External:** 1. Study of vegetative and reproductive structures of *Spirogyra* from fresh or preserved materials. 2. Study of economic importance of Algae 3. Study of vegetative and reproductive structures of *Rhizopus* from fresh or preserved materials. 4. Study of economic importance of Fungi. 5. Study of vegetative and reproductive structures of *Riccia* from fresh or preserved materials. 6. Study of human genetic traits using pedigree analysis 7. Problems based on epistatic interaction between non-allelic genes - Dominant epistasis, recessive epistasis. 8. Study of normal human karyotype. 9. Calculate mean, median, mode and standard deviation from the given data set. 10. Genetically modified crops - Flavr Savr Tomato, Herbicide-Resistant Soybean. **Practical Internal:** 1. Submission of problems based on epistatic interactions. 2. Submission of problems based on pedigree analysis. 3. Submission of problems based on biostatistics.

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Scheme of Examination and Assessment Pattern

Practical Paper – 50 Marks

Semester End Practical exam - 50 marks Time: 2:00 hours

Format of Question Paper

Question No	Questions	Marks
Q.1.	Identify, classify specimen A and B and describe the morphological / Microscopical structures observed.	10
Q. 2	Construct a pedigree chart from the given family data C and explain the pattern of inheritance.	07
Q. 2	Perform the biometry experiment D from the given data set.	05
Q.3.	Identify and describe slides / specimens E and F	05
Q.4.	Journal	03
		Total 30

Key:

A & B- Algae, Fungi, Bryophyta ; C- Pedigree analysis/Problems based on Mendelian genetics; D- Mean, Median, Mode, Standard Deviation E- Economic importance of algae/fungi F- Human Karyotype/Genetically modified crops

Note

1. 75% attendance in practical is compulsory
2. Practical journal is must for practical examination
3. Journal should be certified by Head of Department

	Internal Examination: Continuous Evaluation - 20 marks	
1.	Students should submit problems based on pedigree analysis/ mendelian genetics	10
2.	Students should submit a report on case studies on Human karyotype or genetically modified crops other than mentioned in the practical mentioned above.	10
	Total	**20**

11

Reference books:

- Pandey, B.P. 2005. College Botany Vol. I & II S. Chand Publishing, New Delhi.
- Vashishta, B.R. & Sinha, A.K. – Botany for Degree Students: Algae, Fungi & Bryophyta, S. Chand Publishing.
- Singh, V., Pandey, P.C. & Jain, D.K. 2017. A Textbook of Botany (Lower Plants). Rastogi Publications, Meerut.

	● Gardner, E.J., Simmons, M.J., Snustad, D.P.2006. Principles of Genetics, Wiley India Edition ● S.C. Gupta. 2019. Fundamentals of Statistics, Himalaya Publishing House ● B.D. Singh. 2016. Biotechnology, Kalyani Publishers ● R.C. Dubey. 2018. A Textbook of Biotechnology, S. Chand Publishing

Faculty of Interdisciplinary

Vertical 3: List of Open Elective Skill Based Courses for First Year: Semester - I

Sr. No.	Nomenclature of the Paper
1	Basic Computer Skills for Digital Age
2	Visual Design and Digital Tools : A Foundation For Animation
3	Basic Tools of AI for Economics and Education
4	Communicative English
5	Urbanization and Real Estate: Concepts and Contemporary Scenarios
6	Business of Travel and Tours
7	Managing Family Wealth Through Family Office
8	Web Designing Essentials: HTMLI and CSS Styling Techniques
9	Basics of Nutrition
10	Lessons of Reel Making
11	Performing Arts
12	Data Analysis with Excel
13	Political Communication and Media Skills
14	Stress Management-I
15	Social Media and Communication
16	Mushroom Cultivation: Training and Trading
17	Yoga and Fitness
18	Basic Perfumeries Course (Level-I)
19	Soft Skills for Corporate Readiness
20	Beautician : Strategic Business Planning
21	Current Trends of Fashion Design: Financial Perspective
22	Basics of Accounting-I
23	Digital Marketing
24	Online Trading in Stock Market
25	Event Management Course in Sindhi

Smt. Chandibai Himathmal Mansukhani College, Ulhasnagar (Autonomous)

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College

(Autonomous)

Affiliated to the University of Mumbai

First Year B.Sc. (Botany)

Semester- I

Title: Applied Nutrition and Food Analysis

Vertical 4

Vocational Skill Course (VSC)

Practical Based 2 Credits

with effect from
the Academic Year 2026-2027

Title: Applied Nutrition and Food Analysis

Course Code: CHMBOTI4

Sr. No.	Heading	Particulars
1	Description of the Course:	This practical course in Applied Nutrition and Food Science provides hands-on training in food groups, balanced diet planning, and basic nutritional assessment. It includes qualitative and quantitative analysis of major nutrients along with estimation of key components like Vitamin C, iron, calcium, and phenolics. Students are also introduced to food quality parameters including pH, acidity, and total soluble solids. The course further covers food safety aspects such as adulteration, preservatives, microbial contamination, and spoilage.
2	Vertical	1
3	Type & Teaching Methods	Practicum
4	Credit:	2 Credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives:** **CO(A)1:** To develop practical understanding of basic food groups, balanced diet planning, and nutritional assessment in human health. **CO(A)2:** To train students in qualitative and quantitative analysis of food constituents such as carbohydrates, proteins, fats, vitamins, and minerals. **CO(A)3:** To familiarize students with food quality evaluation techniques including detection of adulterants, anti-nutrients, preservatives, and microbial contamination. **CO(A)4:** To acquire knowledge of applied nutrition through real-life studies such as food labelling, dietary habits, glycemic load, and beverage analysis.	

8	**Course Outcomes (COs)**: After completion of course, Students should be able to **CO1.** Classify food groups and design balanced diet plans based on nutritional requirements. **CO2.** Perform basic qualitative and quantitative analysis of nutrients and interpret results related to food composition. **CO3.** Identify food quality issues such as adulteration, spoilage, and presence of anti-nutritional factors using standard methods. **CO4.** Analyze dietary patterns and nutritional information from food labels to make informed and healthy food choices.
9	**Syllabus** **External practical** **1.** Study of various food groups. **2.** Preparation of a balanced diet chart. **3.** Calculation of Body Mass Index. **4.** Study of nutritional deficiency using chart. **5.** Qualitative test for detection of protein, sugar, fats/oil, starch from the food materials. **6.** Qualitative screening of anti-nutrients in edible food and vegetable materials. **7.** Estimation of Vit. C from the given food material using DCPIP solution. **8.** Estimation of protein by Biurette method. **9.** Separation of carotenoids by paper chromatography. **10.** Separation of Food Dyes by paper chromatography. **11.** Determination of pH of different food items. **12.** Estimation of total soluble solids (TSS) in fruit juices. **13.** Detection of acidity in food samples (titratable acidity) **14.** Microbial load estimation in raw and processed food (basic plating demonstration) **15.** Preparation of ORS. **16.** Microscopic observations of food contaminants/ microbes in spoiled food. **17.** Estimation of Total Phenolic content in plant/food samples **18.** Estimation of Iron from the given food sample. **19.** Estimation of calcium from the given food sample. **20.** Study of food preservation chemicals and their effects. **Internal Practical** **1.** Comparative study of nutritional labelling of packaged food products available in

the market.

2. Study of sugar content in common beverages. (compare: soft drinks, energy drinks, packaged juices, Coconut water / natural drinks).
3. Calculation of glycemic load of selected food items based on nutritional labels.
4. Assessment of food habits among students/food consumption pattern survey of students

Scheme of Examination and Assessment Pattern
Semester End Practical exam - 50 marks Time: 2:00 hours
Format of Question Paper

Question No	Questions	Marks
Q.1.	Estimate ----- from the given sample A.	10
Q.2.	Detect the presence of ----- from the given sample B by qualitative method.	04
Q. 3	Separate the food dyes/carotenoids from the given sample C Using paper chromatography	07
Q.4	Identify and describe D,E and F	06
Q.5	Journal	03

Total 30

Key:
A – Acidity/TSS/Total phenolic content; B- Protein/sugar/starch/fat; C- Paper Chromatography; D, E and F - Nutritional deficiency/ORS/Food adulterants/Food preservatives/Microbial spoilage

Note
1. 75% attendance in practical is compulsory
2. Practical journal is must for practical examination
3. Journal should be certified by Head of Department

No	**Internal Examination: Continuous Evaluation - 20 marks**	**Marks**
1.	Students should submit a report on comparative study of nutritional labelling of packaged food products available in the market. OR Study of sugar content in common beverages. (Compare: Soft drinks, Energy drinks, Packaged juices, Coconut water / natural drinks).	10
2.	Students should submit a report on calculation of glycemic load of selected food items based on nutritional labels. OR	10

		Survey report on assessment of food habits among students/food consumption pattern.	
			Total = 20
11	**Reference books:** ● Srilakshmi, B. (2020), Nutrition Science (7th Edition), New Age International Publishers, New Delhi. ● Mudambi, S.R. & Rajagopal, M.V. (2019), Fundamentals of Foods, Nutrition and Diet Therapy (7th Edition), New Age International Publishers, New Delhi. ● Gibney, M.J., Lanham-New, S.A., Cassidy, A. & Vorster, H.H. (2019), Introduction to Human Nutrition (3rd Edition), Wiley-Blackwell, Chichester, UK. ● Wardlaw, G.M. & Hampl, J.S. (2018), Perspectives in Nutrition (11th Edition), McGraw Hill Education, New York. ● Ranganna, S. (2017), Handbook of Analysis and Quality Control for Fruit and Vegetable Products (2nd Edition), Tata McGraw Hill Education Pvt. Ltd., New Delhi. ● Nielsen, S.S. (2017). Food Analysis (5th Edition), Springer, New York. ● Deshpande, H.W. & Poshadari, A. (2023). Food Analysis and Quality Control, New India Publishing Agency, New Delhi.		

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

First Year B.Sc.
(Botany)

Semester- I

Title: Tools and Techniques in Plant Science

Vertical - 4
SKILL ENHANCEMENT COURSE (SEC)
Practical based -2 Credits

with effect from
Academic Year 2026-2027

Title: Tools and Techniques in Plant Science
Course Code: CHMBOTI5

Sr. No.	Heading	Particulars
1	**Description of the Course:**	This course provides a comprehensive overview of the modern tools and techniques used in plant science research and applications. Students will gain hands-on experience and theoretical as well as practical knowledge in areas such as microscopy, chromatography, spectrophotometry, extraction of phytochemical, and analysis. The course is designed to build technical skills essential for research, industry, and advanced academic work in plant sciences
2	**Vertical:**	4
3	**Type:**	Practicum
4	**Credit**:	2 Credits
5	**Hours Allotted:**	60 Hours
6	**Marks Allotted**:	50 Marks
7	**Course Objectives**: **CO(A)1:** To enable students, understand the essential laboratory instruments and techniques used in plant science. **CO(A)2:** To enable students, estimate primary and secondary metabolites of Plants. **CO(A)3:** To enable students, to understand Chromatographic and Soxhlet techniques. **CO(A)4:** To enable the students, develop the skills of designing natural household products.	
8	**Course Outcomes (COs):** After completion of course, students should be able to: **CO1:** Learner should be able to understand the essential laboratory instruments and techniques used in plant science. **CO2:** Estimate primary and secondary metabolites of Plants. **CO**3: Analyze and interpret experimental data accurately **CO**4: Develop the skills of designing natural household products **CO**5: Ensure safe and ethical laboratory practices	

Syllabus

1. Good Laboratory Practices
2. Study of Basic Laboratory Instruments (Microscope, Colorimeter, Autoclave, Oven, Incubator and Laminar Air Flow.
3. Microscopy and staining techniques: Plant Micro-technique (T.S., L.S., Whole Mounts)
4. Gram's staining of Bacteria
5. Separation of Amino Acids by Paper Chromatography
6. Preparation of reagents and Buffer solutions
7. Separation of Essential oil by Thin-Layer Chromatography
8. Qualitative Tests for plant Metabolites
    - Primary Metabolites: Proteins, Carbohydrates
    - Secondary Metabolites: Alkaloids, Tannins
9. Extraction of oil by Soxhlet apparatus (Demonstration)
10. Pollen/Spore count using hemocytometer

Internal Practical

1. Interpretation of Biological Data Using Excel
2. Calculation for preparation of different grade reagents

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

Examination: Semester End External - 50 marks Time: 2:00 hours

Format of Question Paper

Question No	Questions	Marks
Q1	Major experiment	10
Q2	Major experiment	10
Q3	Identification (Two Spots)	05
Q4	Journal	05
	TOTAL	**30**

Note

1. 75% attendance in practical is compulsory
2. Practical journal is must for practical examination
3. Journal should be certified by Head of Department

INTERNAL (Practical)

	Assessment/ Evaluation	Marks
1.	Continuous evaluation through Project and Presentations	15
2.	Viva and Attendance	05
	TOTAL	**20**

REFERENCE BOOKS:

1. Plummer,D.T.(1996).*An Introduction to Practical Biochemistry*.TataMcGraw-Hill Publishing Co. Ltd. New Delhi. 3rd edition.

2. Ruzin,S. E.(1999).*Plant Microtechnique and Microscopy* ,Oxford University Press, New York, U.S.Aadhya Pradesh482004Tele-fax:0761-2681236;web: www.jnkvv.org

Botany BOS Committee:

Sr No	Name of the Faculty	Designation and College
1.	Dr. Lal Sahab Yadav	**Head of Department & Chairperson BOS**
2	Prof. Anil Avhad	**Subject Expert VC Nominee Mumbai University R. J. College, Ghatkopar Mumbai**
2.	Prof. K.N. Borse	**Subject Expert from outside the parent University SSVVPS Science College Dhule**
3.	Dr. Suvarna Sharma	**Subject Expert from outside the parent University K. C. College, Charch Gate Mumbai**
	Mr. Prashant Patil	**Smt. CHM College**
	Dr. Darshana Patil	**Smt. CHM College**
	Dr. Lakshmi Girish	**Smt. CHM College**
	Dr. Satish Mourya	**Industry Representative Alumni Hi-Media, Thane**

	Dr. Rajani Shirshat	**Alumni** **V.Z. Kelkar College, Mulund**

Members of Botany Department

Sr. No	Name of the Faculty	Designation and College	Signature
1.	Dr. Lal Sahab Yadav	Head & Associate Professor Smt. CHM College, Ulhasnagar	
2	Mr. Prashant Patil	Assistant Professor Smt. CHM College, Ulhasnagar	
3	Dr. Darshana Patil	Associate Professor Smt. CHM College, Ulhasnagar	
4	Dr. Lakshmi Girish	Associate Professor Smt. CHM College, Ulhasnagar	

Name & Signature of the BoS Chairperson: DR. LALSAHAB YADAV

Name & Signature of the Dean: Dr. NEENA ANAND

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College, Ulhasnagar

(Autonomous)

Affiliated to the University of Mumbai

Bachelor of Commerce/ Arts/Science/ SFC (Sindhi)

(AEC – Ability Enhancement Course)

(Aided Course)

Semester – I

Choice Based and Credit Based syllabus as per NEP 2020 with effect from the Academic Year 2025-2026

PREAMBLE

The Bachelor of Commerce (B.Com.) in Sindhi is a comprehensive program designed to develop Sindhi language. Language is the soul of Literature. Sindhi is medium of Communication, Education and Cultural exchange. Curriculum is designed specially in digital age.

Language enriches literature. This curriculum is prepared according to Social, Cultural and Academic needs. The B.Com. Sindhi subject offers students a unique opportunity to explore and widened Sindhi Culture through a wide range of literary programs. The curriculum not only emphasizes literary appreciation and analysis but also fosters ethical awareness, intercultural sensitivity and social responsibility.

The program is committed to developing critical thinking, ethical reasoning and inclusive perspectives. It encourages students to reflect and engage with communication in Sindhi, expertise in Business and Employment Creative work, meditation and listening, use of visual tails, expertise of asking questions, knowledge of different languages through communication.

Language allows us to share our ideas, thoughts, feelings and emotions with others through communication. There is a special contribution of the ideal citizen in nation building. It plays crucial role in creating civilized society.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO-1 Students will understand the communication skills and role of language in communication.

PSO-2 Students will be able to talk effectively in Sindhi language with friends, relatives and Business customers.

PSO-3 Students will understand aspects of language.

PSO-4 Students will be able to understand the Importance of communication, and they will communicate in different ways i.e. verbal, non-verbal, written and Digital methods.

Smt

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

First Year

Semester- I

Title: Communication Skills in Sindhi

Vertical - 5
Ability Enhancement Course
2 Credit

with effect from
Academic Year 2025-2026

Title: Communication Skills in Sindhi
COURSE CODE: CHMSINIAEC

Sr. No.	Heading	Particulars
1	**Description the Course:**	Communication is the core component of commerce and trade. In communication, language plays very significant role. If a student has mastered the skills of language, undoubtedly, he or she would be able to communicate in the best manner. In this course basic part of Sindhi language would be taught based on the NEP 2020. Innovative approaches like critical thinking, creative mind, and use of technology will lead to communicating and participating with different groups. The vocabulary section would be given prominence. The course would be in the Devanagari script so that it can attract majority of the students. Even non-Sindhi students shall have opportunity to adopt this course.
2	**Vertical 1**	AEC – Ability Enhancement Course
3	**Type**	Theory + Practicum (Teaching Method: Lecture/ Discussion/Reading)
4	**Credit**	2 credits (1 credit = 15 hours for theory or 30 hours of Practical work in a semester)
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50Marks
7	**Course Objectives**: After successful completion of this course: **CO(A) 1:** The learner will get understanding of communication skills. **CO(A) 2:** The learner will understand how to accurate the pronunciation of special words in Sindhi **CO(A) 3:** The learner will improve the conversation skill in Sindhi. **CO(A) 4:** The learner will become best communicator in Sindhi language	
8	**Course Outcomes**: Student will be able to **CO1**: Know the basic special features of Sindhi language. **CO2**: Understand communication skills. **CO3**: Knowing the conversation with businessmen and customers **CO4**: Know the etiquettes with parents, relatives, friends and others in effective way	

9	**Syllabus**

UNIT I: Fundamental of Sindhi Communication

- Introduction of Communication skills through Pictorial Presentation
- Importance of Language
- Basic aspects of language:
  i) Types of Language, ii) Role of Language, iii) Changes in Language iv) Non-violent aspects of language v) Language & New generation vi) Language & Modern technology
- New Education Policy (NEP) & Importance of language
- Sindhi language: (Special features of spoken Sindhi language with pronunciation through audio visual presentation

UNIT II: Functional Communication

- Importance of Communication
- Types of Communication (Presentation through video clips):
  i) Verbal, ii) non-verbal, iii) Written iv) Digital Communication
- Characteristics of Communication
- Obstacles in Communication of Sindhi Language
- Methods of Best Communication through role plays
- Spoken Sindhi in Business
- Conversation with customers and proprietors

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Syllabus

यूनिट १: सिंधी राबते जो बुनियाद

- संचारी भाषा: वाक्फियत
- भाषा जी अहिमियत
- भाषा जा बुनियादी पहलू

  १) किस्म, २) भाषा जो किरदार, ३) भाषा मे तबदीलियूं, ४) भाषा जा अहिसासाती पहलू ५) बोली ऐ नई पीड़ी ६) बोली ऐ जदीद टेकनालाजी
- नई तैलीमी नीति ऐं बोलियुन जी अहमियत
- असां जी सिंधी बोली

यूनिट २: अमली राबतो (असराइतो गालाइण जो तरीको)

- राबते जी अहमियत
- राबते जा किस्म

  १) जिबानी राबतो, २) गैर जिबानी राबतो, ३) लिख्त राबतो ४) डिजीटल राबतो राबते मां फायदा
- रााबते में रंडकुं
- बेहतर राबते जा तरीका
- ग्राहकन सां सिंधी बोलीअ मे गुफ्तगू
- कारोबार में सिंधी गालाइण

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10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

External Examination: Semester End External - 30 marks Time: 1:00 hour

Format of Question Paper

Question No	Nature of Questions	Marks
Q1.A)	Objective Type Questions (Unit- I)	05
Q1.B)	Attempt ANY 2 out of 4- (5 marks each) (Unit-I)	10
Q2.A)	Objective Type Questions (Unit- II)	05
Q2.B)	Attempt ANY 2 out of 4- (5 marks each) (Unit-II)	10
Total		**30**
		Total 30

Internal Examination: Continuous Evolution - 20 marks

	Assessment / evaluation	Marks
1.	**Written assignment on any one of the following topics** 1) Draft a Notice and Report writing in Sindhi 2) Simulate dialogues such as interview, daily conversation and public speaking in Sindhi (Students are required to use AI assistance in the preparation of their drafts. Eg: Microsoft Copilot, Google Gemini, Google voice Typing tool)	15
2.	Class Attendance and Participation	05
	Total	**20**

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REFERENCE BOOKS:

1. Sanchari Basha – By Dr. Pushpa Kodwani
2. Sindhi Pahakaa – Dr. Jetly M.K.
3. Sindhi Muhavahra – By Hardwani Lachhman
4. Sindhi Adhyat mak Shabdhkesh – By Hardwani Lachhman
5. Acho Sindhi Sikhu – By Hardwani Lachhman

Syllabus Committee:

Sr No	Name of the Faculty	Designation and College	Signature
1.	Mrs. Kajal Ramchandani	**H.O.D. of Jai Hind College**	
2.	Mrs. Komal Totani	**Assistant Teacher, Smt. CHM College**	

Name & Signature of the BoS Chairperson: (Mrs. Kajal Ramchandani)_____

Name & Signature of the Dean: (Dr. Nitin Arekar) _____

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

First Year B.Sc.

Semester- I

Vertical – 5

Ability Enhancement Course (English)

2 Credits

with effect from
Academic Year 2025-2026

Title: Introduction to Communication Skills in English
Course Code: CHMBSCAECI

Sr. No.	Heading	Particulars
1	**Description the Course:**	Effective communication is the cornerstone of academic and professional success. This course introduces learners to foundational skills in English communication, with a focus on both oral and written competencies essential in academic, social, and workplace contexts. It aims to equip learners with the ability to read critically, write precisely, speak confidently, and listen actively. Emphasis is placed on building clarity, coherence, and conciseness in communication, along with an understanding of audience, purpose, and tone. The course integrates grammar reinforcement, vocabulary building, reading comprehension, and practice-oriented modules such as email etiquette, group discussion, and formal writing. Through dynamic classroom interactions and practical assessments, learners will gain confidence in using English effectively and purposefully**.**
2	**Vertical 4**	Ability Enhancement Course
3	**Type** Teaching Methods:	Theory+ Practicum (Lecture/ Discussion/ Presentation/ Reading sessions/ Worksheets/ etc.)
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: CO(A)1: To introduce learners to the fundamentals of effective communication and its components. CO(A)2: To enhance learners' reading comprehension through exposure to multiple genres and contexts. CO(A)3: To develop grammatical accuracy and lexical resourcefulness for academic and professional communication. CO(A)4: To strengthen verbal and non-verbal presentation skills and promote interactive speaking abilities.	

	CO(A)5: To build competence in real-world writing tasks such as email drafting, bio-data preparation, and descriptive writing.
8	**Course Outcomes**: Student will be able to CO-1: Understand and apply key principles of effective communication in varied contexts. CO-2: Comprehend and analyze written texts using appropriate reading strategies. CO-3: Recognize and correct common grammatical and lexical errors. CO-4: Engage in clear, confident, and context-appropriate spoken interactions. CO-5: Produce structured, coherent, and grammatically correct written content for academic and workplace use.

9	**Syllabus**

UNIT I: Foundations of English Communication

A) Core Concepts of Communication

- Principles of Effective Communication: The 7 Cs
- Verbal and Non-verbal Communication with Examples
- Cross-cultural Communication in the Globalized World
- Technology in Communication: Email, Messaging, Video Conferencing
- Listening for Detail and Intent: Barriers to Listening and Strategies

B) Reading Comprehension

- Understanding the Main Idea and Supporting Details
- Interpreting Tone, Purpose, and Bias
- Using Context Clues for Vocabulary Building
- Reading Visual Texts: Graphs, Charts, and Infographics
  Sample readings will include excerpts from news articles, reports, editorials, and educational essays (200–250 words).

C) Grammar and Vocabulary

- Subject-Verb Agreement
- Sentence Structures
- Punctuation and Capitalization
- Commonly Confused Words
- Editing and Proofreading Practice

A remedial and functional approach will be followed with contextual exercises.

UNIT II: Applied Communication Skills

A) Speaking and Listening Skills

- Introducing Oneself in Academic/Professional Settings
- Participating in Group Discussions and Expressing Opinions
- Delivering a Short Speech (2–3 minutes) on Familiar Topics
- Understanding and Responding to Instructions
- Listening Comprehension Practice through Audio/Video Clips

B) Functional Writing Skills

- Formal Email Writing with Subject and Tone Sensitivity
- Descriptive Paragraph Writing (People, Places, Processes)
- Bio-data and Resume Writing
- Drafting Job Applications (Solicited and Unsolicited)
- Writing a Statement of Purpose

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

External Examination: Semester End External - 30 marks Time: 1:00 hour

Format of Question Paper

Question No	Nature of Questions	Marks
Q. 1	**Short Notes** (Attempt any 3 out of 5) - **Unit 1** **OR** **Essay-Type Question** (Attempt any 1 out of 2)- **Unit 1**	15
Q. 2	**Short Notes** (Attempt any 3 out of 5) - **Unit 2** **OR** **Essay-Type Question** (Attempt any 1 out of 2)- **Unit 2**	15
	Total	**30**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Students are required to draft a job application letter along with a resume using the following AI assistance: Canva Resume Builder, Resume.oi, Zety, Novopresume, Rezi etc **OR** Draft an SoP with the help of the following AI assistance: Quillbot, Yocket, Writesonic, Jasper AI	15
2.		05
	Total	**20**

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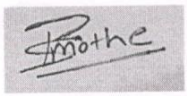
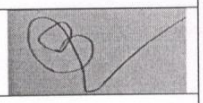
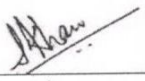
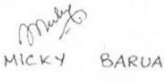
REFERENCES:

1. Adler, Ronald B., et al. *Understanding Human Communication*. 15th ed., Oxford UP, 2021.
2. Bailey, Stephen. *Academic Writing: A Handbook for International Students*. 5th ed., Routledge, 2018.
3. Barrass, Robert. *Students Must Write: A Guide to Better Writing in Coursework and Examinations*. Routledge, 2005.
4. Brown, Gillian, and George Yule. *Teaching the Spoken Language: An Approach Based on the Analysis of Conversational English*. Cambridge UP, 1983.
5. Carnegie, Dale. *The Quick and Easy Way to Effective Speaking*. Pocket Books, 2006.
6. Chaney, Lillian, and Jeanette Martin. *Intercultural Business Communication*. 6th ed., Pearson, 2014.
7. Cullen, Pauline, et al. *English Grammar in Use Supplementary Exercises*. Cambridge UP, 2019.
8. Eastwood, John. *Oxford Guide to English Grammar*. Oxford UP, 2005.

9. Gerson, Sharon J., and Steven M. Gerson. *Technical Communication: Process and Product*. 9th ed., Pearson, 2021.
10. Hewings, Martin. *Advanced Grammar in Use: A Self-study Reference and Practice Book for Advanced Learners of English*. 3rd ed., Cambridge UP, 2013.
11. Jones, Leo. *Functions of English: Communication Practice in English*. Cambridge UP, 1981.
12. Kumar, Sanjay, and Pushp Lata. *Communication Skills*. 2nd ed., Oxford UP, 2018.
13. Lynch, Tony. *Listening in Language Learning*. Longman, 1988.
14. McCarthy, Michael, and Felicity O'Dell. *Academic Vocabulary in Use*. Cambridge UP, 2008.
15. Nordquist, Richard. *The Essentials of English Grammar*. McGraw-Hill Education, 2016.
16. Quirk, Randolph, et al. *A Comprehensive Grammar of the English Language*. Longman, 1985.
17. Seely, John. *The Oxford Guide to Writing and Speaking*. Oxford UP, 2005.
18. Straus, Jane, et al. *The Blue Book of Grammar and Punctuation*. 12th ed., Jossey-Bass, 2021.
19. Wallace, Catherine. *Reading*. Oxford UP, 1992.
20. Zinsser, William. *On Writing Well: The Classic Guide to Writing Nonfiction*. Harper Perennial, 2016.

Syllabus Committee:

Sr. No	Name of the Faculty	Designation and College	Signature
1.	Prof. (Dr.) Kailas Aute	Professor & Head, Dept. of English, Smt. CHM College	
2.	Prof. (Dr.) B. R. Hiramani,	(VC Nominee, University of Mumbai) Pancham Khemraj College, Sawantwadi	
3.	Prof. (Dr.) Vikas Raskar	(Subject Expert outside University) Hutatma Rajguru Mahavidyalay, Rajguru Nagar, Khed, (Affiliated to Savitribai Phule University)	
4.	Prof. (Dr.) Prashant Mothe	(Subject Expert outside University) Aadarsh Mahavidyalay, Umerga, Dharashiv, (Affiliated to Dr. Baba Saheb Ambedkar Marathwada University	
5.	Mr. Ananda Pandhare	Asst. Professor, Dept. of English, Smt. CHM College	
6.	Ms. Sana Khan	Asst. Professor, Dept. of English, Smt. CHM College	
7.	Dr. Micky Barua	Faculty Vidyalankar Institute of technology, Alumni Member	 MICKY BARUA
8.	Ms. Sofy Verghese	Accenture, Industry Representative	

Name & Signature of the Ad-hoc BoS Chairperson: Prof. (Dr). Kailas Aute 

Name & Signature of the Dean: Prof. (Dr). Nitin Arekar 

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

First Year

Semester - I

Title: Indian Knowledge System

Vertical - 5
IKS Subject - 2 Credits

With effect from
Academic Year 2025-2026

Title: Indian Knowledge System
Course Code: CHMIKSI

Sr. No.	Heading	Particulars
1	**Description the Course:**	This course introduces students to the Indian Knowledge System (IKS), emphasizing its historical depth, cultural relevance, and interdisciplinary value. Rooted in the context of Indian civilization, it explores the holistic development of knowledge from ancient to pre-modern times, including contributions in medicine, mathematics, logic, linguistics, governance, arts, and sciences. By revisiting the traditional education systems and intellectual heritage of India, the course encourages learners to connect ancient insights with contemporary disciplines. It aims to enhance awareness, foster appreciation of indigenous wisdom, and reveal the interconnectedness of various streams of knowledge, aligning with the goals of the NEP 2020.
2	**Vertical 5**	IKS
3	**Type & Teaching Methods**	Theory + Practicum Lectures/Discussions/Presentations/Case Studies, etc.
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: **CO(A)1:** To sensitize the students about context in which they are embedded i.e. Indian culture and civilization including its Knowledge System and Tradition. **CO(A)2:** To help student to understand the knowledge, art and creative practices, skills and values in ancient Indian system. **CO(A)3:** To help to study the enriched scientific Indian heritage. **CO(A)4:** To introduce the contribution from Ancient Indian system & tradition to modern science & Technology.	
8	**Course Outcomes**: Student will be able to **CO1:** Understand and appreciate the rich Indian Knowledge Tradition. **CO2:** Understand the contribution of Indians in various fields. **CO3:** Experience increase subject-awareness and self-esteem. **CO4:** Develop a comprehensive understanding of how all knowledge is ultimately intertwined.	

9	**Syllabus** **UNIT I: Introduction** • **Introduction to IKS** (What is knowledge System, Characteristic Features of Indian Knowledge System) • **Why IKS?** (Macaulay's Education Policy and its impact, Need of revisiting Ancient Indian Traditions) • **Scope of IKS** (The Universality of IKS (from Micro to Macro), development form Earliest times to 18th Century CE) • **Tradition of IKS** (Ancient Indian Education System: Home, Gurukul, Pathashala, Universities and ancient educational centres) • **Relevant sites in the vicinity of the Institute** (Water Management System at Kanheri, Temple Management of Ambernath, etc.) **UNIT II** • Medicine (Ayurveda) • Alchemy • Mathematics • Logic • Art of Governance (Arthashastra) **UNIT III (Select Any FIVE out of the following)** • Aesthetics • Town Planning • Strategic Studies • Krishi Shastra • Vyakaran & Lexicography • Natyashastra • Ancient Sports • Astronomy • Yoga and Wellbeing • Linguistics • Chitrasutra • Architecture • Taxation • Banking • Trade and Commerce

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

External Examination: Semester End External - 30 marks Time: 1:00 hours

Format of Question Paper

Attempt all questions.

Question No	Nature of Questions	Marks
Q1	Attempt any two out of five	06
Q2	Attempt any three out of five	12
Q3	Attempt any three out of fifteen	12
TOTAL		**30**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Class test during lectures (MCQ / Short notes / Match the pairs / Puzzles)	10
2.	Participation in Workshop / Conference / Seminar / Case Study / Field Visit / Certificate Course / Project presentation / Viva	10
TOTAL		**20**

11

REFERENCES:

1. Concise history of science in India- D.M. Bose, S.N Sen, B.V. Subbarayappa.
2. Positive sciences of the Ancient Hindus- Brajendranatha seal, Motilal Banrasidas, Delhi 1958.
3. History of Chemistry in Ancient India & Medieval India, P. Ray- Indian Chemicals Society, Calcutta 1956.
4. Charaka Samhita- a scientific synopsis, P. Ray & H.N Gupta National Institute of Sciences of India, New Delhi 1965.
5. MacDonnell A.A- History of Sanskrit literature.
6. Winternitz M- History of Indian Literature Vol. I, II.
7. Dasgupta S.N & De S.K- History of Sanskrit literature Vol' I.
8. Ramkrishna Mission- cultural heritage of India Vol' I, II.
9. Majumdar R. C & Pushalkar A.D- History & culture of the Indian people, Vol. I, II & III.
10. Keith A.B- History of Sanskrit literature.

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

First Year

Semester- I

Title: Cocurricular Course I

Vertical - 6
Cocurricular Course - 2 Credits

with effect from
Academic Year 2025-2026

Title: Cocurricular Course - I

Course Code: CHMCCI6

Sr. No.	Heading	Particulars
1	**Description the Course:**	This student-friendly Co-Curricular Course is uniquely designed to promote holistic development through active participation in various college-based activities. Unlike traditional theory-based subjects, this course emphasizes hands-on involvement and experiential learning. Students are encouraged to explore their interests and talents by engaging in cultural, social, literary, sports, extension, or club-based events conducted by the college throughout the academic year. Participation will be recorded and assessed based on involvement, initiative, team spirit, creativity, and consistency. The aim is to nurture essential life skills such as leadership, communication, collaboration, and responsibility in a supportive, informal setting. This non-theory course offers students the opportunities and the freedom to learn beyond the classroom and grow into well-rounded individuals, contributing positively to campus life and society.
2	**Vertical 6**	Cocurricular Course (Mandatory)
3	**Type** **Teaching Methods**	Non Theory Participation, Report Writing, Presentation etc.
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: 1. To inculcate a spirit of active participation in cultural, social, environmental, and creative activities. 2. To enhance personal and interpersonal skills through real-life experiences and teamwork. 3. To foster a sense of responsibility, leadership, and community engagement among students. 4. To develop self-confidence and emotional well-being through creative expression and collaboration. 5. To integrate classroom learning with experiential learning for holistic growth.	
8	**Learning Outcomes**: By the end of the course, students will be able to: **LO1:** Participate meaningfully in diverse co-curricular activities and reflect on their learning experiences. **LO2:** Demonstrate improved communication, leadership, and teamwork skills. **LO3:** Exhibit increased awareness of social responsibility and civic engagement. **LO4:** Build confidence through creative, cultural, and intellectual expressions. **LO5:** Maintain a portfolio or activity log to track participation and personal development.	

9	**Syllabus** **Unit I - Suggested Areas of Participation in the activities:** • **Cultural Events:** Drama, dance, music, literary events, debates, etc. • **Social Outreach:** Blood donation, awareness campaigns, cleanliness drives. • **Clubs & Societies:** Photography, quiz, environment club, shram club, etc. • **Sports & Fitness:** College tournaments, yoga, marathons, fitness challenges. • **Institutional Events:** Foundation Day, Annual Day, College Festivals, Intercollegiate events. • **National Festivals:** Independence Day, Republic Day etc. **Unit II - Program Specific Topics** • **Workshops/Seminars:** Report Writing, Personality Development, Soft Skills, Leadership Talks. • **Speak, Show, Shine:** Presentation / Poster Presentation / Viva and Learning Experience **Mode of Evaluation:** • **Faculty Coordinator:** To guide and evaluate student progress. • **Participation Proof:** Certificates, photos, attendance records. • **Reflective Journal:** Minimum 2–3 pages summarizing experiences, learning, and growth. • **Final Viva/Presentation:** 5-minute talk on poster presentation and on overall learning.
10	**Scheme of Examination and Assessment Pattern** **Based on 3 approved Activities** **Semester End External - 30 marks**

Activity No	Nature of Activities	Marks
1.	Title of Approved Activity - 1	10
2.	Title of Approved Activity - 2	10
3.	Title of Approved Activity - 3	10
	Total	**30**

Internal Examination: Continuous Evaluation – 20 marks

	Assessment / Evaluation	Marks
1.	Reflective journal	10
2.	Presentation/ poster presentation/viva	10
	Total	**20**

Suggested Readings:

- How to Win Friends and Influence People
- The 7 Habits of Highly Effective People
- Thinking, Fast and Slow
- Leaders Eat Last
- Talk Like Ted

Name & Signature of the Principal & Chairperson, Academic Council:

Dr. Manju Lalwani Pathak

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College, Ulhasnagar

(Autonomous)

Affiliated to the University of Mumbai

Bachelor of Science (Botany)

Semester – II

with effect from
the Academic Year 2026-2027

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

First Year B.Sc.
(Botany)

Semester- II

Title: Core Concepts in Plant Science

Vertical - 1
Major Subject -2 Credits

with effect from
Academic Year 2026-2027

Title: Core Concepts in Plant Science

Course Code: CHMBOTII1

Sr. No.	Heading	Particulars
1	**Description of the Course:**	This course provides foundational knowledge of plant cell biology, physiology, and diversity. It covers the ultra-structure and functions of the plasma membrane, stages of the cell cycle, mitosis and its importance, and the biochemical pathways of photosynthesis including light and dark reactions. The course also explores the life cycles and reproductive strategies of Pteridophytes (*Nephrolepis*) and Gymnosperms (*Cycas*). In addition, students will study plant anatomical features such as stomata, epidermal outgrowths, and tissue systems, along with the structure and functioning of ecosystems through examples of one terrestrial and one aquatic ecosystem.
2	**Vertical**	1
3	**Type**	Theory
4	**Credit**	2 Credits Theory
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: **CO(A)1:** To understand the students, plasma membrane structure, cell cycle phases, and mitosis in plants. **CO(A)2:** To enable the students to understand the light and dark reactions of photosynthesis and their role in energy production. **CO(A)3:** To enable the students to understand the life cycles and key characteristics of Pteridophytes (*Nephrolepis*) and Gymnosperms (*Cycas*). **CO(A)**4: To enable the students to identify plant anatomical features and basic ecosystem types, emphasizing structure–function and ecological relationships.	
8	**Course Outcomes (COs)**: After completion of course, student should be able to: **CO1:** demonstrate their understanding of the plasma membrane structure, the stages of the cell cycle, and the process of mitosis in plants.	

CO2: explain the mechanisms of light and dark reactions in photosynthesis.

CO 3: describe and compare the alternation of generations in *Nephrolepis* and *Cycas*.

CO 4: identify plant tissue systems, stomatal types, epidermal structures, and classify basic ecosystem types.

9

Syllabus

UNIT I: Cytology and Plant Physiology

1. Ultra structure and Functions of Plasma Membrane.
2. Cell cycle, Mitosis in plant cells and its significance.
3. Photosynthesis: Light reaction (Cyclic and Non-cyclic) and Dark reaction.

UNIT II: Diversity of Vascular Plants, Anatomy and Ecology

1. Pteridophyta- Systematic position and life cycle (excluding development stages of sex organs) of *Nephrolepis.*
2. Gymnosperms- Systematic position and life cycle (excluding development stages of sex organs) of *Cycas.*
3. Anatomy: Types of Stomata, Epidermal Outgrowth, Tissue system.
4. Ecology: Introduction and types of Ecosystems

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

External Examination: Semester End External - 30 marks Time: 1:00 hour

Format of Question Paper

Note:

1. Attempt all questions.
2. All questions carry equal marks

Question No	Questions	Marks	Module
Q.1.	Multiple choice Questions/ Fill in the blanks (Any five out of ten) 5 from each module	5	1 & 2
Q2.	Answer in one -two sentences (Any five out of ten) 5 from each module	5	1 & 2
Q3.	Answer any one of the following (Any one out of two)	10	1
Q4.	Answer any one of the following (Any one out of two)	10	2
TOTAL		**30**	

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
2.	Attendance / *Viva voce*	05
		Total 20

11

Reference books:

1. Gangulee Das and Dutta: College Botany Volume I and II (1994). New Central Book Agency, Calcutta (6th Edition).
2. Botany for Degree students by B. R. Vashishta (Algae, Fungi, Bryophyta)
3. Pteridophyta by P.C. Vashishta. S. Chand Publication.
4. Gymnosperms by P.C. Vashishta. S. Chand Publication.
5. Cell and Molecular Biology by De Robertis and De Robertis Jr.
6. Plant Physiology by Noggle and Fritz.
7. Plant Physiology and Development by Taize and Zeiger
8. Ecology by E.P. Odum.

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

First Year B.Sc.
(Botany)

Semester- II

Title: Practicals in Core concepts of Plant Science

Vertical - 1
Practical -2 Credits

with effect from
Academic Year- 2026-2027

Title: Practicals in Core concepts of Plant Science

Course Code: CHMBOTII2

Sr. No.	Heading	Particulars
1	**Description of the Course:**	This course provides hands on experience in studying plant morphology, anatomy, physiology, and basic genetics through a series of laboratory and field-based practicals. Students will explore the vegetative and reproductive structures of ferns (*Nephrolepis*) and gymnosperms (*Cycas*), examine anatomical differences in dicot and monocot stems, and identify various stomata and trichome types. The course also covers ecological adaptations in plants, stages of mitosis, and medicinal plants from "Grandma's Pouch". Additionally, students will study human karyotypes, perform paper chromatography for chlorophyll separation, and collect seeds from natural habitats. The course integrates modern learning through AI tools for students and includes an educational study visit for applied understanding.
2	**Vertical 1**	1
3	**Type:**	Practicum
4	**Credit**:	2 Credits
5	**Hours Allotted:**	60 Hours
6	**Marks Allotted**:	50 Marks
7	**Course Objectives:** **CO(A)1**: To enable the students to study the vegetative and reproductive structures of Pteridophytes and Gymnosperms (*Nephrolepis* and *Cycas*). **CO(A)2:** To enable the students to differentiate types of stomata, trichomes, and anatomical features of dicot and monocot stems. **CO(A)3:** To enable the students to observe plant adaptations to different ecological conditions and study cellular events through mitotic stages and human karyotypes. **CO(A)4:** To learn the basic plant science experiments, such as pigment separation, seed collection, and medicinal plant study, while integrating AI tools and field exposure for experiential learning.	
8	**Course Outcomes (COs)**: After completion of course, student should be able to: **CO1**. examine vegetative and reproductive structures of *Nephrolepis* and *Cycas*.	

CO2. identify types of stomata and trichomes.

CO3. compare ecological adaptations of hydrophytes, xerophytes, halophytes, and stages of mitosis and human karyotypes.

CO4. demonstrate proficiency in plant-based practical techniques, including pigment separation, seed collection, and medicinal plant studies.

CO5. effectively utilize AI tools and field visits to enhance biological learning, scientific observation, and analytical skills.

9

Syllabus

1. Study of vegetative and reproductive structures of *Nephrolepis*.
2. Study of vegetative and reproductive structures of *Cycas*.
3. Types of Stomata.
4. Types of Trichomes.
5. Ecological adaptations of plants (Hydrophytes, Xerophytes, and Halophytes).
6. Study of different stages of Mitosis.
7. Study of plants from Grandma's Pouch (Tulsi, *Aloe*, Ginger, *Adulsa*).
8. Study of Normal Human Karyotype (Male and Female).
9. Separation of chlorophyll pigments by Paper chromatography.
10. Collection of seeds from natural habitats.
11. AI tools for students.
12. Study visit.

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

Examination: Semester End External - 50 marks Time: 2:00 hours

Format of Question Paper

Question No	Questions	Marks
Q1	Practical	10
Q2	Practical	10
Q3	Identification (Two Spots)	05
Q4	Journal	05
	TOTAL	**30**

Note

1. 75% attendance in practical is compulsory
2. Practical journal is must for practical examination

3. Journal should be certified by Head of Department

Scheme of Examination and Assessment Pattern
Internal: Semester End Internal - 20 marks
Format of Question Paper

	Assessment/ Evaluation	**Marks**
1.	Continuous evaluation through Project and Presentations	15
2.	Attendance/*Viva-voce*	05
	TOTAL	**20**

Reference books:

1. B. P. Pandey College Botany, Vol. I. 2022, S. Chand Publishing
2. B. P. Pandey College Botany, Vol. II. 2022, S. Chand Publishing
3. V. Singh, P. C. Pandey and D. K. Jain: A Textbook of Botany, 2014, 5th Ed. Rastogi Publications
4. C. J. Alexopoulos, C. W. Mims and M. Blackwell. 1996. Introductory Mycology. 4th Edition, John Wiley & Sons
5. A. Rashid. 1999. An Introduction to Pteridophyta. 2nd Ed. Vikas Publishing House Pvt. Ltd.
6. S. P. Bhatnagar and A. Moitra. 1996. Gymnosperms. New Age International Publishers
7. B. Pandey. 2007. Taxonomy of Angiosperms, S. Chand Publishing
8. Gurcharan Singh, 2019. Plant Systematics: Theory and Practice, 4th Ed. Oxford & IBH Publishing

Faculty of Interdisciplinary

Vertical 3: List of Open Elective Skill Based Courses for First Year: Semester – II

Sr. No.	Nomenclature of the Paper
1	Cyber and Digital Safety
2	Audio -Video Editing Foundation for Graphics Design and Basics of Animation II
3	Basic Tools of AI for Economics and Education - II
4	English for Professional and Corporate World
5	Urbanisation and Real Estate
6	Business of Travel and Tours-II
7	Managing Family Wealth through Family Office
8	Interactive Web Design using Java Script
9	Basics of Nutrition II
10	Reels Production and Creator Branding
11	Performing Art
12	Data Analysis with Advanced Excel
13	Advanced Political Communication and Media Skills
14	Stress Management
15	Social Media and Society Identity, Power and Digital Citizenship
16	Mushroom Cultivation Training and Trading Level
17	Yoga and Fitness II
18	Basic Perfumery Course (Level-II)
19	Soft Skills II-Personal and Interpersonal Effectiveness
20	Beautician - Strategic Business Planning-II
21	Current Trends of Fashion Designing- Financial Perspective Level-II
22	Basic Accounting-II
23	Digital Marketing II
24	Online Trading and Stock Market-II
25	Event Management Course in Sindhi

Smt. Chandibai Himathmal Mansukhani College, Ulhasnagar (Autonomous)

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

First Year B.Sc.
(Botany)

Semester- II

Title: Horticultural practices

Vertical – 4

Vocational Skill Course (VSC)
Practical based -2 Credits

with effect from
Academic Year 2026-2027

Title: Horticultural Practices
(Course Code: CHMBOTII4)

Sr. No.	Heading	Particulars
1	**Description of the Course:**	This practical course provides hands-on training in nursery management, ornamental horticulture, plant propagation, and sustainable horticultural practices. Students develop skills in garden design, soil and potting media preparation, nursery raising, vegetative propagation, cultivation of ornamental and edible plants, eco-friendly nursery products, and basic post-harvest processing. The course also includes pest and disease identification, nursery visits, and practical exposure to commercial horticulture, preparing students for careers and entrepreneurship in the horticulture sector.
2	**Vertical**	4
3	**Type:**	Practicum
4	**Credit**:	2 Credits
5	**Hours Allotted:**	60 Hours
6	**Marks Allotted**:	50 Marks
7	**Course Objectives** 1. Apply principles of garden planning, nursery management, soil analysis, and plant propagation in practical horticultural operations. 2. Demonstrate techniques for vegetative propagation, seedling production, terrarium preparation, and cultivation of indoor ornamental and air-purifying plants. 3. Analyze soil properties, honey quality, and plant health for effective nursery and horticultural management. 4. Evaluate sustainable horticultural practices, including biodegradable nursery pot preparation, microgreen production, and fruit and vegetable processing for value addition. 5. Design nursery-based horticultural projects by integrating scientific knowledge, practical skills, and entrepreneurial concept	
8	**Course Outcomes (COs)**: After successful completion of this course, students will be able to: **CO1**. apply principles of garden design, nursery management, soil testing, and use of horticultural	

	implements in practical horticultural activities **CO2**. perform vegetative propagation techniques, raise healthy seedlings, prepare terrariums, cultivate microgreens, and propagate ornamental plants using appropriate methods. **CO3**. analyze soil characteristics, honey samples, and identify common plant pests and diseases to support effective nursery and crop management. **CO4**. evaluate sustainable horticultural practices by preparing biodegradable nursery pots, selecting suitable indoor air-purifying plants, and processing fruits and vegetables for value addition. **CO5**. design and present a nursery-based horticultural enterprise by integrating landscape planning, propagation techniques, sustainable production practices, and entrepreneurial skill.
9	**Syllabus** **External Practical:** 1. Garden Layouts- Formal/Informal gardens 2. Garden Locations and suitable plants 3. Garden Implements (Identification and uses). 4. Preparation of potting mixtures for different horticultural crops 5. Estimation of water holding capacity, texture, and pH of soil 6. Methods of cutting, budding, layering, and grafting 7. Division of bulbs, rhizomes, suckers, and tubers. 8. Propagation of variegated ornamental plants by vegetative methods 9. Indoor Air purifier plants 10. Preparation Terrarium 11. Preparation of biodegradable nursery pots using agricultural waste (coir pith, paper pulp, bagasse) 12. Raising seedlings in nursery trays and polybags 13. Honey sample analysis 14. Plant pests and diseases (Identification) **Internal Practical** **1.** Microgreens production and harvesting. 2. Preparation of floral album 3. Fruits and vegetable processing – Dehydrated fruits/vegetable/squash 4. Visit to nursery

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

Examination: Semester End External - 50 marks Time: 2:00 hours

Format of Question Paper

Question No	Questions	Marks
Q1	Practical	10
Q2	Practical	10
Q3	Identification (Two Spots)	05
Q4	Journal	05
	TOTAL	**30**

Note

7. 75% attendance in practical is compulsory
8. Practical journal is must for practical examination
9. Journal should be certified by Head of Department

Scheme of Examination and Assessment Pattern

Paper – 20 Marks

Internal: Semester End Internal - 20 marks

Format of Question Paper

	Assessment/ Evaluation	Marks
1	Continuous evaluation through Project and Presentations	15
2.	Attendance/*Viva-voce*	05
	TOTAL	**20**

Reference books:

1. Handbook of Horticulture- Indian council of Agricultural Research New Delhi
2. Text Book of Horticulture by Rajendra Singh

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

First Year B.Sc.
(Botany)

Semester- II

Title: Entrepreneurship and Applied Skills

Vertical - 4
Skill Enhancement Course (SEC)
Practical based -2 Credits

with effect from
Academic Year 2026-2027

Title: Entrepreneurship and Applied Skills
(Course Code: CHMBOTII5)

Sr. No.	Heading	Particulars
1	**Description of the Course:**	This course provides hands-on training in mushroom cultivation, including spawn preparation, substrate setup, incubation, harvesting, and product development. Students also learn to prepare herbal and Ayurvedic products, study plant-based nutraceuticals, practice plant preservation methods, extract essential oils, and isolate mycorrhizal fungi. Biodiversity documentation using QR codes and GPS, along with an industry visit, enhances practical skills and entrepreneurial understanding.
2	**Vertical**	4
3	**Type:**	Practicum
4	**Credit**:	2 Credits
5	**Hours Allotted:**	60 Hours
6	**Marks Allotted**:	50 Marks
7	**Course Objectives** **CO(A)1:** To learn basic techniques of mushroom cultivation and value-added product preparation. **CO(A)2:** To acquire skills in making herbal and Ayurvedic products and understanding nutraceuticals. **CO(A)3:** To enable students to practice plant preservation, essential oil extraction, and mycorrhizal isolation methods. **CO(A)4:** To enable the students to use QR/GPS tools for biodiversity documentation and gain industrial exposure through visits.	
8	**Course Outcomes (COs):** After completion of course, students should be able to: **CO**1: perform mushroom cultivation steps from spawn preparation, cultivation, harvesting	

	and product development. **CO**2: prepare basic herbal and Ayurvedic formulations and identify plant-based nutraceuticals. **CO**3: apply preservation techniques, extract essential oils, natural colour and able to prepare biological products. **CO**4: use QR and GPS tools for biodiversity recording and gain practical industry insights through field exposure.
9	**Syllabus** **External Practical:** **1.** Oyster Mushroom Cultivation • Harvesting and packaging of mushrooms. • Mushroom value-added products. **2.** Aseptic transfer of explants or microbial cultures **3.** Preparation of natural food colours from flowers and vegetables **4.** Preparation of herbal soap, face mask, and shampoo. **5.** Preparation of herbal tea and product labeling **6.** Wet and dry preservation techniques of plants. **7.** Extraction of essential oils of Lemon grass. (Demonstration using Clevenger Apparatus) **8.** Extraction of Anthocyanin Pigments and study of the effect of pH on colour change **9.** Preparation and application of a Plant Biostimulant using Moringa leaves and *Aloe* vera **10.** Ayurvedic preparations. (Triphala Churn) **11.** Market survey of herbal or nursery products **12.** Industry visit. **Internal Practical:** **1.** Biodiversity documentation: QR codes and GPS **2.** Spawn production for Mushroom cultivation. **3.** Preparation and presentation of a micro-enterprise model based on botanical

resources.

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

Examination: Semester End External - 50 marks Time: 2:00 hours

Format of Question Paper

Question No	Questions	Marks
Q1	Practical	10
Q2	Practical	10
Q3	Identification (Two Spots)	05
Q4	Journal	05
	TOTAL	**30**

Note

4. 75% attendance in practical is compulsory
5. Practical journal is must for practical examination
6. Journal should be certified by Head of Department

Scheme of Examination and Assessment Pattern

Paper – 20 Marks

Internal: Semester End Internal - 20 marks

Format of Question Paper

	Assessment/ Evaluation	Marks
1	Continuous evaluation through Project and Presentations	15
2.	Attendance/*Viva-voce*	05
	TOTAL	**20**

Reference books:

1. Techniques of Mushroom Cultivation by S. R. Mishra
2. Mushroom Cultivation for Beginners by Abraham Beck.
3. Mushroom Cultivation and Culture by L.P. Awasthi.
4. Triphala Diet by Anand Gupta.

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

First Year B.Sc.

Semester- II

Vertical – 5

Ability Enhancement Course (English)

2 Credits

with effect from
Academic Year 2025-2026

Title: Advanced English for Workplace and Academic Communication
Course Code: CHMBSCAECII

Sr. No.	Heading	Particulars
1	**Description of the Course:**	In an increasingly competitive academic and professional landscape, learners require advanced communication skills that enable clarity, precision, critical thinking, and professionalism. This course focuses on practical, real-world communication abilities needed for college-level academic work, job applications, workplace collaboration, and digital interactions. Through hands-on tasks, real-world assignments, and communication practice, learners become adept in using English confidently and appropriately in diverse settings.
2	**Vertical 5**	**AEC: Advanced English for Workplace and Academic Communication**
3	**Type** Teaching Methods:	Theory+ Practicum (Lecture/ Discussion/ Presentation/ Reading sessions/ Worksheets/ etc.)
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: CO(A)1: To develop advanced communication skills required for academic and professional success. CO(A)2: To train learners in report writing, summary writing, and formal documentation. CO(A)3: To enhance proficiency in digital and virtual communication platforms. CO(A)4: To strengthen presentation, interview, and workplace communication skills. CO(A)5: To build confidence in expressing ideas clearly to varied audiences.	
8	**Course Outcomes**: After completing this course, learners will be able to: **CO-1:** Demonstrate clarity, precision, and professionalism in communication. **CO-2:** Interpret and summarize written texts, visuals, and data accurately. **CO-3:** Prepare well-structured reports, emails, and professional documents.	

CO-4: Use digital tools and virtual communication etiquette effectively.

CO-5: Communicate confidently in interviews, presentations, and teamwork situations

9

Syllabus

UNIT I: Communication for Academic & Professional Settings (15 Hours)

A. Communication in Academic & Workplace Contexts

1. Features of formal communication
2. Audience-centered communication
3. Ethics in communication: integrity, attribution, clarity
4. Explaining concepts in simple and clear language
5. Interpreting graphs, charts, tables, and infographics
6. Summarizing data concisely

B. Grammar & Style for Professional Writing

1. Tone: formal, neutral, objective
2. Avoiding redundancy and ambiguity
3. Active vs. passive structures
4. Editing, revising, and proofreading techniques

UNIT II: Practical Documentation & Employability Skills (15 Hours)

1. Report writing (academic/field-based/observational)
2. Project summary reports
3. Preparing short presentations
4. Creating informational posters or digital slides
5. Writing a formal complaint or request email
6. Creating a short informational or awareness write-up

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

External Examination: Semester End External - 30 marks Time: 1:00 hour

Format of Question Paper

All questions are compulsory:

Question No	Nature of Questions	Marks
Q. 1	**Short Notes** (Attempt any 3 out of 5) - **Unit 1** **OR** Attempt **Essay Type** question. (1 out of 2) - **Unit 1**	15
Q. 2	**Short Notes** (Attempt any 3 out of 5) - Unit 2 **OR**	15

	Attempt **Essay Type** question. (1 out of 2) - Unit 2	
	Total	**30**

Internal Examination: Continuous Evaluation - 20 marks

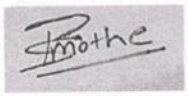
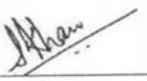
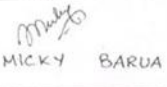
	Assessment / evaluation	**Marks**
1.	Assignments on **any one** of the following topics: Academic/Scientific Report/ Informational Poster / Digital Infographic (Students are required to use AI assistance in the preparation of their drafts. Eg: Notion AI, Otter.ai, Grammarly, Google Gemini, Canva, Piktochart, etc)	15
2.	Class Attendance and Participation	05
	Total	**20**

11

References:

1. Adler, Ronald B., et al. *Understanding Human Communication*. 15th ed., Oxford UP, 2021.
2. Bailey, Stephen. *Academic Writing: A Handbook for International Students*. 5th ed., Routledge, 2018.
3. Cargill, Margaret, and Patrick O'Connor. *Writing Scientific Research Articles*. Wiley-Blackwell, 2013.
4. Eastwood, John. *Oxford Guide to English Grammar*. Oxford UP, 2005.
5. Gerson, Sharon J., and Steven M. Gerson. *Technical Communication: Process and Product*. 9th ed., Pearson, 2021.
6. Hewings, Martin. *Advanced Grammar in Use*. Cambridge UP, 2013.
7. Kumar, Sanjay, and Pushp Lata. *Communication Skills*. 2nd ed., Oxford UP, 2018.
8. McCarthy, Michael, and Felicity O'Dell. *Academic Vocabulary in Use*. Cambridge UP, 2008.
9. Nordquist, Richard. *The Essentials of English Grammar*. McGraw-Hill Education, 2016.
10. Seely, John. *The Oxford Guide to Writing and Speaking*. Oxford UP, 2005.
11. Zinsser, William. *On Writing Well: The Classic Guide to Writing Nonfiction*. Harper Perennial, 2016.

Syllabus Committee:

Sr. No	Name of the Faculty	Designation and College	Signature
1.	Prof. (Dr.) Kailas Aute	Professor & Head, Dept. of English, Smt. CHM College	
2.	Prof. (Dr.) B. R. Hiramani,	(VC Nominee, University of Mumbai) Pancham Khemraj College, Sawantwadi	
3.	Prof. (Dr.) Vikas Raskar	(Subject Expert outside University) Hutatma Rajguru Mahavidyalay, Rajguru Nagar, Khed, (Affiliated to Savitribai Phule University)	
4.	Prof. (Dr.) Prashant Mothe	(Subject Expert outside University) Aadarsh Mahavidyalay, Umerga, Dharashiv, (Affiliated to Dr. Baba Saheb Ambedkar Marathwada University	
5.	Mr. Ananda Pandhare	Asst. Professor, Dept. of English, Smt. CHM College	
6.	Ms. Sana Khan	Asst. Professor, Dept. of English, Smt. CHM College	
7.	Dr. Micky Barua	Faculty Vidyalankar Institute of technology, Alumni Member	
8.	Ms. Sofy Verghese	Accenture, Industry Representative	

Name & Signature of the Ad-hoc BoS Chairperson: Prof. (Dr). Kailas Aute

Name & Signature of the Dean: Prof. (Dr). Nitin Arekar

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

First Year

Semester- II

Title: Cocurricular Course I

Vertical - 6
Cocurricular Course - 2 Credits

with effect from
Academic Year 2025-2026

Title: Cocurricular Course - I

Course Code: CHMCCI6

Sr. No.	Heading	Particulars
1	**Description the Course:**	This student-friendly Co-Curricular Course is uniquely designed to promote holistic development through active participation in various college-based activities. Unlike traditional theory-based subjects, this course emphasizes hands-on involvement and experiential learning. Students are encouraged to explore their interests and talents by engaging in cultural, social, literary, sports, extension, or club-based events conducted by the college throughout the academic year. Participation will be recorded and assessed based on involvement, initiative, team spirit, creativity, and consistency. The aim is to nurture essential life skills such as leadership, communication, collaboration, and responsibility in a supportive, informal setting. This non-theory course offers students the opportunities and the freedom to learn beyond the classroom and grow into well-rounded individuals, contributing positively to campus life and society.
2	**Vertical 6**	Cocurricular Course (Mandatory)
3	**Type** **Teaching Methods**	Non Theory Participation, Report Writing, Presentation etc.
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: 1. To inculcate a spirit of active participation in cultural, social, environmental, and creative activities. 2. To enhance personal and interpersonal skills through real-life experiences and teamwork. 3. To foster a sense of responsibility, leadership, and community engagement among students. 4. To develop self-confidence and emotional well-being through creative expression and collaboration. 5. To integrate classroom learning with experiential learning for holistic growth.	
8	**Learning Outcomes**: By the end of the course, students will be able to: **LO1:** Participate meaningfully in diverse co-curricular activities and reflect on their learning experiences. **LO2:** Demonstrate improved communication, leadership, and teamwork skills. **LO3:** Exhibit increased awareness of social responsibility and civic engagement. **LO4:** Build confidence through creative, cultural, and intellectual expressions. **LO5:** Maintain a portfolio or activity log to track participation and personal development.	

9	**Syllabus** **Unit I - Suggested Areas of Participation in the activities:** • **Cultural Events:** Drama, dance, music, literary events, debates, etc. • **Social Outreach:** Blood donation, awareness campaigns, cleanliness drives. • **Clubs & Societies:** Photography, quiz, environment club, shram club, etc. • **Sports & Fitness:** College tournaments, yoga, marathons, fitness challenges. • **Institutional Events:** Foundation Day, Annual Day, College Festivals, Intercollegiate events. • **National Festivals:** Independence Day, Republic Day etc. **Unit II - Program Specific Topics** • **Workshops/Seminars:** Report Writing, Personality Development, Soft Skills, Leadership Talks. • **Speak, Show, Shine:** Presentation / Poster Presentation / Viva and Learning Experience **Mode of Evaluation:** • **Faculty Coordinator:** To guide and evaluate student progress. • **Participation Proof:** Certificates, photos, attendance records. • **Reflective Journal:** Minimum 2–3 pages summarizing experiences, learning, and growth. • **Final Viva/Presentation:** 5-minute talk on poster presentation and on overall learning.
10	**Scheme of Examination and Assessment Pattern** **Based on 3 approved Activities** **Semester End External - 30 marks**

Activity No	Nature of Activities	Marks
1.	Title of Approved Activity - 1	10
2.	Title of Approved Activity - 2	10
3.	Title of Approved Activity - 3	10
	Total	**30**

Internal Examination: Continuous Evaluation – 20 marks

	Assessment / Evaluation	Marks
1.	Reflective journal	10
2.	Presentation/ poster presentation/viva	10
	Total	**20**

Suggested Readings:

- How to Win Friends and Influence People
- The 7 Habits of Highly Effective People
- Thinking, Fast and Slow
- Leaders Eat Last
- Talk Like Ted

Name & Signature of the Principal & Chairperson, Academic Council:

Dr. Manju Lalwani Pathak

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College, Ulhasnagar
(Autonomous)

Affiliated to the University of Mumbai

Bachelor of Science
(Botany)

Semester – III

with effect from
the Academic Year 2026-2027

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

Second Year B.Sc.
(Botany)

Semester- III

Title: Plant Diversity-I

Vertical - 1
Major Subject -2Credits

with effect from
Academic Year 2026-2027

Title: PLANT DIVERSITY-I

Course Code: CHMBOTIII1

Sr. No.	Heading	Particulars
1	**Description of the Course:**	This course explores the fundamental principles of plant biology and their profound impact on human society. Topics include plant structure and function, reproduction and life cycles, as well as the role of plants in agriculture, medicine, industry, and the global environment. Students will Develop basic skills in taxonomy, morphology, and life cycle analysis of lower and higher plants.
2	**Vertical 1**	Major
3	**Type** **Teaching Methods**	Theory Lecture, Presentation, Seminars, Simulations
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50Marks
7	**Course Objectives**: **CO(A)1:** To provide knowledge of the diversity, classification, structure, and life cycles of algae, fungi, bryophytes, pteridophytes, and angiosperms. **CO(A)2**: To develop understanding of systematic position and distinguishing characteristics of important plant groups and genera. **CO(A)3**: To study the vegetative, floral, and economic importance of selected angiosperm families using Bentham and Hooker's classification system. **CO(A)4**: To explain evolutionary trends in lower vascular plants, especially stelar evolution in pteridophytes. **CO(A)5**: To enhance skills in plant identification, taxonomy, morphology, and reproductive biology.	

8	**Course Outcomes (COs)**: After completing the course, students will be able to: **CO1:** identify and explain the characteristic features, classification, and life cycles of important algae and fungi. **CO2:** differentiate major angiosperm families based on vegetative and floral characters using Bentham and Hooker's classification. **CO3:** compare and distinguish the characteristics of cryptogams that differentiate them from each other. **CO4:** understand the economic importance of cryptogams.
9	**Syllabus** **UNIT- I: Algae, Fungi and Angiosperms** 1. General characteristics of Phaeophyta 2. Systematic position, and life cycle (excluding development stages of sex organs) of *Sargassum* 3. General characteristics of Ascomycetes *4.* Systematic position, and life cycle (excluding development stages of sex organs), *Nurospora,* and *Chetomium.* 5. With the help of Bentham and Hooker's system of Classification for flowering plants study the vegetative, floral characters and economic importance of the following families: • Malvaceae • Asteraceae • Amaranthaceae • Palmae **UNIT–II: Bryophyta and Pteridophyta** ● General characteristics of *Anthocerotae* ● Systematic position, and life cycle (excluding development stages of sex organs) of *Anthoceros* ● General characteristics of *Lepidophyta* ● Structure, life cycle and systematic position of *Lycopodium* ● Stelar evolution in *Pteridophyta*

10

Scheme of Examination and Assessment Pattern

Theory Paper – 50 Marks

External Examination: Semester End External - 30 marks Time: 1:00 hour

Format of Question Paper

Question No	Questions	Marks
Q.1	Choose the correct option. Any five out of 10 (5 question from each unit)	05
Q.2	Answer any five in one sentence out of 10 10 (5 question from each unit)	05
Q.3	Answer any one of the following: (out of two from unit-1)	10
Q.4	Answer any one of the following: (out of two from unit-1)	10
TOTAL		**30**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
2.	Attendance/Viva-Voce	05
		Total 20

11

REFERENCE:

1. Text Book of Algae (1986) by O.P.Sharma. Tata McGraw Hill.
2. Text Book of Botany-Algae (1994) By B. P. Pandey. S. Chand.
3. Text Book of Botany 3rd Edition (2004) Prof. V. Singh, DR. P.C. Pandey & Dr. D.K Jain. V Rastogi Publication. Plant Pathology (1982) Dr. B. P. Pandey. S. Chand & Company LTD.
4. Botany for Degree Students (1960) By B.R. Vashishta, Dr. A.K. Sinha and Dr. V. P. Singhrevised edition 2010 (Reprint 2012), S. Chand & Company LTD.
5. Text Book of Fungi (1989) by O.P.Sharma, Tata Mc.Graw
1. Morphology and Evolution of Vascular Plants (1989) by Gifford, E.M. and FosterA.S. publisher, W.H. Freeman & Co., New York.
2. An Introduction to Pteridophyte (1999) By Abdul Rashid. Reprint 2021, Vikas Publishing House Private Limited.
3. Cryptogamic Botany Volume I and II (1938,1955) by G M Smith McGraw Hill
4. Botany for Degree students-Pteridophytes by Vashishta B.R. (1996)
5. Textbook of Plant Pathology (2006) by A.V.S.S.Sambamurty. Reprint 2012) I.K. InternationalPublishing House Pvt. Ltd.
6. College Botany Volume II(1989) reprint 2014 By Gangulee & Kar. New Central Book Agency (P)Ltd
7. College Botany Vol-III (1984) Reprint 2006 by Susil Kumar Mukherjee
8. Studies in Botany vol.1. 6th edition (Revised 2018) by J.N. Mitra, D.Mitra and Chowdhari, New Central Book Agency (P)LTD.
9. Biology of Bryophytes (1988) by Chopra, R.N., P.N.Kumar

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

Second Year B.Sc.
(Botany)

Semester- III

Title: Functional Botany-1

Vertical - 1
Major Subject – 2 Credits

with effect from
Academic Year 2026-27

Title: Functional Botany-1

Course Code: CHMBOTIII 2

Sr. No.	Heading	Particulars
1	**Description the Course:**	This course offers an in-depth exploration of Biostatistics, Molecular Biology, and Cytology, focusing on the application of statistical methods in biological research, the fundamental principles of molecular biology, and the study of cellular structures and functions. Students will acquire a thorough understanding of how statistical analysis can assist biological experiments and the importance of molecular mechanisms in living organisms.
2	**Vertical**	1
3	**Type** **Teaching Methods**	Theory Lecture, Presentation, Seminars, Simulations
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50Marks
7	**Course Objectives**: **CO(A)1:** To enable the students to understand the process and significance of meiosis**,** emphasizing its role in genetic variation and inheritance. **CO(A)2:** Students will learn the structure and function of cell organelles and organization of chromosomes. **CO(A)3:** Fundamental principles of molecular structures and functions, and the cellular mechanisms that govern life processes. **CO(A)4:** Students will develop the ability to analyze and interpret data effectively, grasp the intricacies of genetic material and its role in heredity, and explore cellular organization and function. **CO(A)5:** Comprehensive understanding of statistical methods applied to biological data.	

8	**Course Outcomes:** After completing the course, students will be able to: **CO1:** describe the stages and significance of meiosis, and explain its role in promoting genetic variation and inheritance patterns. **CO2:** identify and explain the structure and function of major cell organelles, including ribosomes, and analyze chromosome organization in relation to cellular function and heredity. **CO3:** analyze the molecular structures (e.g., DNA, RNA, proteins) and explain the mechanisms that regulate essential cellular processes. **CO4:** analyze and interpret biological data, evaluate genetic patterns (including sex-linked traits), and explain key concepts related to the structure and function of cells and genetic material. **CO5:** apply appropriate statistical methods to analyze biological data, draw meaningful conclusions, and support experimental findings in life science research
9	**Syllabus** **UNIT- I: Cell Biology & Cytogenetics** **1.** Meiosis and its significance **2.** Structure and functions of ribosome (Prokaryotic and Eukaryotic), Endoplasmic Reticulum, Nucleus **3.** Organization of chromosome **4.** Sex linked inheritance- Haemophilia, colour blindness **5.** Lyon's Hypothesis of X chromosome inactivation **Extra nuclear Genetics** **6.** Organelle heredity-Chloroplast determines heredity-Plastid transmission in plants **7.** Variation in Chromosome structure (Chromosomal Aberrations): Definition, Origin, Cytological and Genetic Effects of the following: Deletions, Duplications, Inversions and Translocations. **UNIT–II: Molecular Biology &Biostatistics** **1.** DNA Replication in Prokaryotes and Eukaryotes **2.** Transcription in prokaryotes and eukaryotes: Promoter sites, initiation, elongation and termination. **Biostatistics**: **3.** Introduction, concept and problems based on Coefficient of correlation, Chi Square Test

10

Scheme of Examination and Assessment Pattern

Theory Paper – 50 Marks

External Examination: Semester End External - 30 marks Time: 1:00 hours

Format of Question Paper

Question No	Questions	Marks
Q.1	Choose the correct option. Any five out of 10 (5 question from each unit)	05
Q.2	Answer any five in one sentence out of 10 (5 question from each unit).	05
Q.3	Answer any one of the following: (out of two from unit-1)	10
Q.4	Answer any one of the following: (out of two from unit-2	10
TOTAL	**30**	

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
2.	Attendance/Viva- Voce	05
	Total 20	

11

REFERENCE:

1. R. C. Dube (2008). A Text Book of Biotechnology, S. Chand.
2. P.K. Gupta (2019). Elements of Biotechnology.
3. U. Satyanarayana (2017). Biotechnology.
4. Pal J.K. and Ghaskadabi S.S. (2008). Fundamentals of Molecular Biology.
5. Verma and Agrawal (2010). Molecular Biology
6. Devi P (2008). Principle and Methods of Plant Molecular Biology,Biochemistry and Genetics Agrobios, Jodhpur, India
7. Russel, P.J. 1998. Genetics (5th edn) The Benjamin/ Cummins Pub. Co., Inc. USA.
8. Griffiths, A.J.F and Gilbert, W.M (2nd edn). Modern genetic analysis. W.H. Freeman and Company, New York, USA. Lewin, B. Genes VIII. Oxford, University Press. New

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

Second Year B.Sc.
(Botany)

Semester- III

Title: Practical Approaches in Plant Science I

Vertical - 1
Major Subject – 2 Credits

with effect from
Academic Year 2026-27

Title: Practical Approaches in Plant Science I

Course Code: CHMBOTIII 3

Sr. No.	Heading	Particulars
1	**Description of the Course:**	This course provides practical exposure to plant diversity through the study of life cycles of Algae, Fungi, Bryophytes, and Pteridophytes using fresh/preserved specimens and permanent slides. Students will also study selected angiosperm families, focusing on floral morphology and economic importance. In cell biology, students will estimate DNA from plant material, observe meiosis, and explore plastid inheritance. The course also introduces biostatistical analysis through problems on correlation and Chi-square tests. Emphasis is placed on developing observational, analytical, and experimental skills across classical and modern biology.
2	**Vertical**	1
3	**Type Teaching Methods**	Practicum
4	**Credit**	2 Credits
5	**Hours allotted**	60 Hours
6	**Marks allotted**	50Marks
7	**Course Objectives**: **CO(A)1:** Understand and identify key stages in the life cycles of representative algae, fungi, bryophytes, and pteridophytes through practical examination. **CO(A)2:** Recognize morphological features and economic significance of selected angiosperm families with emphasis on floral structures. **CO(A)3:** Develop proficiency in basic cell biology techniques, including DNA estimation and the study of meiosis and plastid inheritance. **CO(A)4:** Apply biostatistical tools such as correlation and Chi-square tests to analyze biological data.	
8	**Course Outcomes**: After completing the course, students will be able to:	

	CO1. identify and describe the stages in the life cycles of algae, fungi, bryophytes, and pteridophytes using appropriate specimens and slides and classify selected angiosperm families based on floral morphology and explain their economic importance. **CO2.** perform basic cell biology experiments**,** including the estimation of DNA from plant material and the study of meiosis using suitable samples and **CO3.** analyze inheritance patterns with a focus on plastid inheritance and relate them to broader genetic principles. **CO4.**solve biostatistical problems involving correlation coefficients and Chi-square tests to interpret biological data.
9	**Syllabus** **External Practical:** **Algae:** 1. Study of stages in the life cycle of *Sargassum* from fresh/preserved material and permanent slides. **Fungi:** 2. Study of stages in the life cycle of *Xylaria* and *Chetomium* from fresh/preserved material and permanent slides. **Bryophyta:** 3. Study of stages in the life cycle of *Anthoceros* from fresh/preserved material and permanent slides. **Pteridophyta:** 4. Study of stages in the life cycle of *Lycopodium* fresh/preserved material and permanent slides. **Angiosperms:** 5. Morphology of floral whorls. . Study of one plant from each family prescribed under theory: morphological peculiarities and economic importance of the members of these families. **Cell Biology and Cytogenetics:** 7. Estimation of DNA from plant material (one Std. & one Un-known, No Std. Graph) 8. Study of inheritance pattern with reference to Plastid Inheritance. 9. Study of Meiosis using suitable material. 10. Study of cytological consequences of chromosomal aberrations (Laggards, Chromosomal Bridge, Ring chromosome, Chromosomal ring) from permanent slides or photomicrographs. **Internal Practical:** 1. Biostatistics: Problems based on Co-efficient of correlation and Chi- square test.

2. Fungi: Problems based on genetic mapping using *Neurospora crassa*
3. Field Visit/Industrial visit

10

Scheme of Examination and Assessment Patten

Theory Paper- 50 Marks

A. External Examination: Semester End External- 30 Marks Time: 2 hrs.

Format of Question Paper

Question No	Questions	Marks
Q1	Practical	10
Q2	Practical	10
Q3	Identification	05
Q4	Journal	05
	TOTAL	**30**

B. Internal Examination: Continuous Evaluation-20 Marks

	Assessment/ Evaluation	Marks
1.	Continuous evaluation through Project/Survey/Field Visit/Industrial Visit	10
2.	Report of the same	05
3.	Viva-Voce	05
	TOTAL	**20**

11.

REFERENCES :

1. Harborne, J.B. (1973). Phytochemical Methods. John Wiley & Sons. New York
2. Robertis, D. (1987). Cell and molecular biology
3. Russell, P. J. (2010). iGenetics- A Molecular Approach. Benjamin Cummings, U.S.A. 3rd edition
4. College Botany Volume II (1989) reprint 2014 By Gangulee & Kar. New Central Book Agency (P)Ltd.
5. Textbook of Biostatistics (2000), A. K. Sharma, Discovery Publishing House, New Delhi
6. Introduction to Biostatistics (A Textbook of Biometry) (2007), Banerjee Pranab Kumar, S. Chand

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

Second Year B.Sc.
(Botany)

Semester- III

Title: Nutraceuticals and Environmental Science

Vertical - 2
Minor Subject – 2 Credits

With effect from
Academic Year2026-27

Title: Nutraceuticals and Environmental Science

Subject Code: CHMBOTIII 4

Sr. No.	Heading	Particulars
1	**Description of the Course:**	This course offers an overview of the multidisciplinary field of nutraceuticals, emphasizing their origin, classification, and importance in plant science and human health. The course also introduces the concept of free radicals, oxidative stress, and the role of plant-based antioxidants in protecting against cellular damage and chronic diseases. This course focuses on the structure and functioning of ecosystems, ecological succession, and community organization. along with qualitative and quantitative characteristics of ecological communities including species diversity, trophic structure, frequency, and density.In addition, it introduces bioremediation techniques used for pollution control, emphasizing microbial and phytoremediation methods, and the role of bacteria, fungi, and hyperaccumulator plants in environmental cleanup.
2	**Vertical**	2
3	**Type** **Teaching Methods**	Theory Lecture, Presentation, Seminars, Simulations
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50Marks
7	**Course Objectives**: **CO(A)1:** To provide an overview of nutraceuticals, including their origin, classification, plant-based sources, and their role in promoting human health and preventing chronic diseases. **CO(A)2:** To introduce the concepts of free radicals and oxidative stress, and explain the protective functions of plant-derived antioxidants in cellular health.	

	CO(A)3: The objectives of the course are to develop an understanding of ecological succession, community structure, ecosystem dynamics, and the significance of keystone species in maintaining ecological balance. **CO(A)4:** It also seeks to provide knowledge of bioremediation techniques and their environmental applications, highlighting the role of microorganisms and plants in pollution control and sustainable environmental management.
8	**Course Outcomes**: After completing the course, students will be able to: **CO1:** describe the origin, classification, and plant-based sources of nutraceuticals, and explain their significance in promoting human health and preventing chronic diseases. **CO2:** define free radicals and oxidative stress, and analyze the role of plant-derived antioxidants in protecting cells from oxidative damage **CO3:** explain the processes and types of ecological succession, and analyze qualitative and quantitative characteristics of ecological communities such as species diversity, trophic structure, frequency, density, and species abundance. **CO4:** describe the principles, mechanisms, and factors affecting bioremediation, including bioaccumulation, biosorption, and biodegradation and evaluate the role of microorganisms and plants in environmental cleanup through microbial bioremediation and phytoremediation techniques.
9	**Syllabus** **UNIT-1: Introduction to Nutraceuticals as Plant Science** **1.** Classification, scope and prospects of nutraceuticals **2.** Sources of Nutraceuticals **3.** Nutraceuticals in Medicine and health **4.** Concept of free radical and antioxidants **UNIT- 2**: **Ecology and Environmental Science** **1.** Succession: Processes in succession, Types of succession (Hydrosere and Xerosere) **2.** Community characteristics - • Qualitative characters: Growth forms, Species diversity, Trophic structure • Quantitative characters: Frequency, Density, species abundance • Community gradient and boundaries: Ecotone, Edge effect, Ecological indicators, concept of Keystone species **3.** Bioremediation: Introduction, principle, Factors affecting bioremediation, Mechanisms (bioaccumulation, biosorption, biodegradation) • Microbial Bioremediation - Role of bacteria and fungi in pollutant degradation • Phytoremediation - Concept and importance, Hyperaccumulator plants, mechanisms involved in pollution removal

10	**Scheme of Examination and Assessment Pattern** Theory Paper – 50 Marks **External Examination: Semester End External - 30 marks Time: 1:00 hours** Format of Question Paper

Question No	Questions	Marks
Q.1	Choose the correct option. Any five out of 10 (5 question from each unit)	05
Q.2	Answer any five in one sentence out of 10 (5 question from each unit).	05
Q.3	Answer any one of the following: (out of two from unit-1)	10
Q.4	Answer any one of the following: (out of two from unit-2	10
TOTAL		**30**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
2.	Attendance/Viva-Voce	05
		Total 20

Reference Books:

1. Harborne, J.B. (1973). Phytochemical Methods. John Wiley & Sons. New York
2. Sharma A (2017) Principles Of Therapeutic Nutrition And Dietetics, CBS
3. Fundamentals of Ecology — by Eugene P. Odum & Gary W. Barrett, W.B. Saunders Company
4. A Textbook of Ecology and Environment — by P.D. Sharma, Rastogi Publications, Meerut, India
5. Applied Bioremediation and Phytoremediation — edited by Ajay Singh & Owen P. Ward, (2004), Springer
6. Phytoremediation: Transformation and Control of Contaminants — by Steven McCutcheon & Jerald Schnoor (2003), John Wiley & Sons

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

Second Year B.Sc.
(Botany)

Semester- III

Title: Nutraceuticals and Environmental Science

Vertical - 2
Minor Subject – 2 Credits

with effect from
Academic Year 2026-27

Title: Practical Approaches in Nutraceuticals and Environmental Science
Course Code: CHMBOTIII5

Sr. No.	Heading	Particulars
1	**Description of the Course:**	This practical course provides hands-on training in analytical techniques related to nutraceuticals and environmental science. It introduces students to the identification and estimation of nutritionally important plant constituents, including proteins, vitamins, pigments, and nutraceutical compounds. The course also emphasizes ecological assessment through biodiversity studies and environmental monitoring by analyzing various physico-chemical parameters of water quality. Field and industrial visits further expose students to real-world applications of environmental assessment and nutraceutical research, thereby enhancing scientific skills, environmental awareness, and problem-solving abilities.
2	**Vertical**	2
3	**Type**	Practicum
4	**Credit**	2 Credits
5	**Hours allotted**	60 Hours
6	**Marks allotted**	50Marks
7	**Course Objectives**: **CO(A)1:** To acquaint students with laboratory techniques for the separation, identification, and quantitative estimation of bioactive compounds and nutritionally important constituents from plant materials. **CO(A)2:** To develop practical skills in evaluating the nutritional quality and nutraceutical potential of plant-based products. **CO(A)3:** To impart knowledge and hands-on experience in ecological assessment and environmental monitoring using standard analytical methods. **CO(A)4:** To enable students to assess biodiversity and water quality parameters for understanding ecosystem health and environmental sustainability. **CO(A)5:** To promote scientific observation, data interpretation, and experiential learning through field and industrial visits.	

8 **Course Outcomes**: After completing the course, students will be able to:

CO1: assess plant-based nutraceuticals and understand their nutritional and health significance.

CO2: separate and identify plant pigments, bioactives, and nutraceuticals, and explain their roles in health and nutrition.

CO3: understand the process of gluten formation and evaluate its functional importance in various types of flour.

CO4: evaluate ecological and environmental parameters by calculating species diversity using Shannon index and analyzing water quality indicators such as dissolved oxygen, BOD, hardness, salinity, and chlorinity, along with gaining practical exposure through field/industrial visits.

9

Syllabus

External Practical:

1. Separation of Carotenoids/ Curcumin by Thin Layer Chromatography
2. To study the concept of Gluten formation of various flours.
3. Estimation of proteins by Lowry's method.
4. Estimation of vitamin C from suitable plant material.
5. Study of plant-based nutraceuticals
6. Assessing Species Diversity: A Quadrate Study Using Shannon Indices.
7. Estimation of Dissolved Oxygen demand from given water sample.
8. Estimation of Biological Oxygen demand from given water sample.

Internal Practical

1. Estimation of Hardness from given water sample.
2. Estimation of Salinity and Chlorinity from given water sample.
3. Field Visit/Industrial visit

10

Scheme of Examination and Assessment Patten
Paper- 50 Marks

A. External Examination: Semester End External- 30 Marks Time: 2 hrs.

Format of Question Paper

Question No	Questions	Marks
Q1	Practical	10
Q2	Practical	10
Q3	Identification	05
Q4	Journal	05
	TOTAL	**30**

B. Internal Examination: Continuous Evaluation - 20 marks

		Assessment/ Evaluation	**Marks**
	1.	Continuous evaluation through Project/Survey/Field Visit/Industrial Visit	10
	2.	Report of the same	05
	3.	Viva Voce	05
		TOTAL	**20**
11.	**Reference Books:** 1. An Introduction to Practical Biochemistry (1987), David T. Plummer, McGraw-Hill Publications 2. Practical methods in ecology and environmental science (1987), RK Trivedy, PK Goel, CL Trisal, Enviro Media Publications		

Faculty of Interdisciplinary

Vertical 3: List of Open Elective Skill Based Courses for Second Year: Semester – III

Sr. No.	Nomenclature of the Paper
1	Data Analysis And Visualization Using Excel
2	2D Animation And Motion Graphics
3	Advance Tools Of AI For Economics And Education - I
4	English For Journalism And Advertising
5	Urbanization And Real Estate: Infrastructure, Technology And Urban Change
6	Tourism Marketing
7	Managing Family Wealth Through Family Office-III
8	Responsive &Amp; Modern Web Designing
9	Basics Of Nutrition -3
10	Reel Making For Media And Social Change
11	Preforming Art- Dance-3
12	Data Analysis With Excel And Power BI
13	Digital Political Strategy, AI And Public Engagement Skills
14	Psychology Of Personal Relationship-I
15	Introduction To Sociology And Digital Society
16	Mushroom Cultivation Training And Trading Level 3
17	Yogasanas: Intermediate Series
18	Perfumery Course Level 3
19	Workplace And Professional Skills
20	Beautician: Strategic Business Planning III
21	Current Trends In Fashion Designing: Financial Perspective Level 3
22	Basics Of Accounting-III
23	Digital Marketing -III
24	Advanced Trading Strategies In Stock Market

Smt. Chandibai Himathmal Mansukhani College (Autonomous) Ulhasnagar

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

Second Year B.Sc.
(Botany)

Semester- III

Title: Agriculture Biotechnology

Vertical - 4
SEC – 2 Credits

with effect from
Academic Year 2026-27

Title: Agriculture Biotechnology
Subject Code: CHMBOTIII 7

Sr. No.	Heading	Particulars
1	**Description of the Course:**	This practical course provides hands-on training in agricultural biotechnology with emphasis on sustainable agriculture, biofertilizers, soil health management, organic composting, seed technology, and plant growth promotion. Students gain practical experience in the isolation and mass multiplication of beneficial microorganisms, preparation of biofertilizers and nutrient solutions, seed quality testing, soil health assessment, and characterization of organic composts. The course promotes skill development in applying biotechnological approaches for sustainable crop production and soil fertility management.
2	**Vertical**	4
3	**Type** **Teaching Methods**	Practicum
4	**Credit**	2 Credits
5	**Hours allotted**	60 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives:** **CO(A)1:** Develop practical skills in the isolation, cultivation, and formulation of beneficial microorganisms used as biofertilizers and biocontrol agents. **CO(A)2:** Demonstrate the preparation and application of microbial and plant-based biofertilizers, nutrient solutions, and plant growth regulators. **CO(A)3:** Perform seed quality assessment and seed biopriming techniques to improve crop establishment. **CO(A)4:** Analyze soil health and organic compost quality using standard physical and chemical parameters. **CO(A)5:** Apply agricultural biotechnology techniques to promote sustainable agriculture and environmentally friendly farming practices.	

8	**Course Outcomes (COs)**: After completion of course, student should be able to: **CO1:** Perform aseptic handling of beneficial microorganisms. **CO2:** Prepare and formulate biofertilizers and plant growth regulators. **CO3:** Assess seed quality using standard testing methods. **CO4:** Analyze soil and compost quality using laboratory techniques. **CO5:** Prepare and interpret a Soil Health Card. **CO6:** Maintain laboratory records and interpret experimental data.
9	**Syllabus** 1. Isolation of *Rhizobium* from root nodules/ *Trichoderma* from soil 2. Cultivation and mass multiplication of *Trichoderma/Rhizobium* and formulation of bio-product for sustainable agriculture. 3. Biofertilizers: • Microbial based- *Azatobactor* and *Nostoc* • Plant based- *Glyricidia, Sesbania, Crotalaria* 4. Preparation of a Plant Growth Regulator/Nutrient Solution: Hoagland solution. IAA, IBA and Study their effect on rooting in stem cuttings 5. Testing of seed viability by TTC method 6. Seed Biopriming with Beneficial Microorganisms 7. Testing of soil health and soil health management – Making Soil Health Card (SHC). • Soil pH • Soil types • Estimation of soil organic carbon 8. Characterization of organic compost: Physical and Chemical characteristics • Moisture content • Bulk density • Water-holding capacity • pH • Organic carbon • C:N ratio (calculation using provided data) 9. Field visits-Biofertilizer production unit/Agricultural research station **Activity:** • Composting of kitchen wastes. • Comparative evaluation of biofertilizers on seed germination • Preparation of a soil health card of locally available soil sample

10 Scheme of Examination and Assessment Pattern

Theory Paper – 50 Marks

A. External Examination: Semester End External - 30 marks Time: 2:00 hours

Format of Question Paper

Question No	Questions	Marks
Q1	Practical	08
Q2	Practical	08
Q3	Identification	09
Q4	Journal	05
	TOTAL	**30**

B. Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Internal experiments	10
2.	Activity	10
		Total 20

11 Text Books/Reference Books:

1. Handbook of Organic farming and Biofertilizers by A.C. Gaur - Ambika Book Agency (2006).
2. Agricultural Microbiology Based Entrepreneurship - Edited by Natarajan Amaresan, Dhanasekaran Dharumadurai, Olubukola Oluranti Babalola – Springer
3. Microbial- Based Biopesticides: Methods and Protocols - Edited by Travis R. Glare, Maria E. Moran-Diez – Humana Press
4. Mushrooms Cultivation, Marketing and Consumption -Directorate of Mushroom Research (Indian Council of Agricultural Research) - Chambaghat Solan-173213
5. Methods Manual: Soul Testing in India - Department of Agriculture & Cooperation, Ministry of Agriculture, Gov. of India

Botany BOS Committee:

Sr No	Name of the Faculty	Designation and College
1.	Dr. Lal Sahab Yadav	**Head of Department & Chairperson BOS**
2.	Prof. Anil Avhad	**Subject Expert VC Nominee Mumbai University** **R. J. College, Ghatkopar Mumbai**
3.	Prof. K.N. Borse	**Subject Expert from outside the parent University** **SSVVPS Science College Dhule**
4.	Dr. Suvarna Sharma	**Subject Expert from outside the parent University** **K. C. College, Charch Gate Mumbai**
5.	Mr. Prashant Patil	**Smt. CHM College**
6.	Dr. Darshana Patil	**Smt. CHM College**
7.	Dr. Lakshmi Girish	**Smt. CHM College**
8.	Dr. Satish Mourya	**Industry Representative Alumni** **Hi-Media, Thane**
9.	Dr. Rajani Shirshat	**Alumni** **V.Z. Kelkar College, Mulund**

Members of Botany Department

Sr. No	Name of the Faculty	Designation and College	Signature
1.	Dr. Lal Sahab Yadav	Head & Associate Professor Smt. CHM College, Ulhasnagar	
2	Mr. Prashant Patil	Assistant Professor Smt. CHM College, Ulhasnagar	
3	Dr. Darshana Patil	Associate Professor Smt. CHM College, Ulhasnagar	
4	Dr. Lakshmi Girish	Associate Professor Smt. CHM College, Ulhasnagar	

Name & Signature of the BoS Chairperson: DR. LALSAHAB YADAV

Name & Signature of the Dean: Dr. NEENA ANAND

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

Second Year B.Sc.

Semester- III

Vertical – 5

Ability Enhancement Course (English)

2 Credits

(To be offered to Students who opted Sindhi AEC in Sem I & II)

with effect from
Academic Year 2025-2026

Title: Introduction to Communication Skills in English
Course Code: CHMBSCAECIII

Sr. No.	Heading	Particulars
1	**Description the Course:**	Effective communication is the cornerstone of academic and professional success. This course introduces learners to foundational skills in English communication, with a focus on both oral and written competencies essential in academic, social, and workplace contexts. It aims to equip learners with the ability to read critically, write precisely, speak confidently, and listen actively. Emphasis is placed on building clarity, coherence, and conciseness in communication, along with an understanding of audience, purpose, and tone. The course integrates grammar reinforcement, vocabulary building, reading comprehension, and practice-oriented modules such as email etiquette, group discussion, and formal writing. Through dynamic classroom interactions and practical assessments, learners will gain confidence in using English effectively and purposefully**.**
2	**Vertical 4**	Ability Enhancement Course
3	**Type** Teaching Methods:	Theory+ Practicum (Lecture/ Discussion/ Presentation/ Reading sessions/ Worksheets/ etc.)
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: CO(A)1: To introduce learners to the fundamentals of effective communication and its components. CO(A)2: To enhance learners' reading comprehension through exposure to multiple genres and contexts. CO(A)3: To develop grammatical accuracy and lexical resourcefulness for academic and professional communication. CO(A)4: To strengthen verbal and non-verbal presentation skills and promote interactive speaking abilities.	

	CO(A)5: To build competence in real-world writing tasks such as email drafting, bio-data preparation, and descriptive writing.
8	**Course Outcomes**: Student will be able to CO-1: Understand and apply key principles of effective communication in varied contexts. CO-2: Comprehend and analyze written texts using appropriate reading strategies. CO-3: Recognize and correct common grammatical and lexical errors. CO-4: Engage in clear, confident, and context-appropriate spoken interactions. CO-5: Produce structured, coherent, and grammatically correct written content for academic and workplace use.

9	**Syllabus**

UNIT I: Foundations of English Communication

A) Core Concepts of Communication

- Principles of Effective Communication: The 7 Cs
- Verbal and Non-verbal Communication with Examples
- Cross-cultural Communication in the Globalized World
- Technology in Communication: Email, Messaging, Video Conferencing
- Listening for Detail and Intent: Barriers to Listening and Strategies

B) Reading Comprehension

- Understanding the Main Idea and Supporting Details
- Interpreting Tone, Purpose, and Bias
- Using Context Clues for Vocabulary Building
- Reading Visual Texts: Graphs, Charts, and Infographics
  Sample readings will include excerpts from news articles, reports, editorials, and educational essays (200–250 words).

C) Grammar and Vocabulary

- Subject-Verb Agreement
- Sentence Structures
- Punctuation and Capitalization
- Commonly Confused Words
- Editing and Proofreading Practice

A remedial and functional approach will be followed with contextual exercises.

UNIT II: Applied Communication Skills

A) Speaking and Listening Skills

- Introducing Oneself in Academic/Professional Settings
- Participating in Group Discussions and Expressing Opinions
- Delivering a Short Speech (2–3 minutes) on Familiar Topics
- Understanding and Responding to Instructions
- Listening Comprehension Practice through Audio/Video Clips

B) Functional Writing Skills

- Formal Email Writing with Subject and Tone Sensitivity
- Descriptive Paragraph Writing (People, Places, Processes)
- Bio-data and Resume Writing
- Drafting Job Applications (Solicited and Unsolicited)
- Writing a Statement of Purpose

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

External Examination: Semester End External - 30 marks Time: 1:00 hour

Format of Question Paper

Question No	Nature of Questions	Marks
Q. 1	**Short Notes** (Attempt any 3 out of 5) - **Unit 1** **OR** **Essay-Type Question** (Attempt any 1 out of 2)- **Unit 1**	15
Q. 2	**Short Notes** (Attempt any 3 out of 5) - **Unit 2** **OR** **Essay-Type Question** (Attempt any 1 out of 2)- **Unit 2**	15
	Total	**30**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Students are required to draft a job application letter along with a resume using the following AI assistance: Canva Resume Builder, Resume.oi, Zety, Novopresume, Rezi etc **OR** Draft an SoP with the help of the following AI assistance: Quillbot, Yocket, Writesonic, Jasper AI	15
2.		05
	Total	**20**

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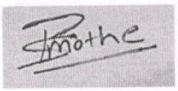
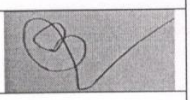
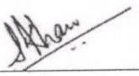
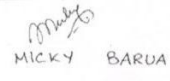
REFERENCES:

1. Adler, Ronald B., et al. *Understanding Human Communication*. 15th ed., Oxford UP, 2021.
2. Bailey, Stephen. *Academic Writing: A Handbook for International Students*. 5th ed., Routledge, 2018.
3. Barrass, Robert. *Students Must Write: A Guide to Better Writing in Coursework and Examinations*. Routledge, 2005.
4. Brown, Gillian, and George Yule. *Teaching the Spoken Language: An Approach Based on the Analysis of Conversational English*. Cambridge UP, 1983.
5. Carnegie, Dale. *The Quick and Easy Way to Effective Speaking*. Pocket Books, 2006.
6. Chaney, Lillian, and Jeanette Martin. *Intercultural Business Communication*. 6th ed., Pearson, 2014.
7. Cullen, Pauline, et al. *English Grammar in Use Supplementary Exercises*. Cambridge UP, 2019.
8. Eastwood, John. *Oxford Guide to English Grammar*. Oxford UP, 2005.

9. Gerson, Sharon J., and Steven M. Gerson. *Technical Communication: Process and Product*. 9th ed., Pearson, 2021.
10. Hewings, Martin. *Advanced Grammar in Use: A Self-study Reference and Practice Book for Advanced Learners of English*. 3rd ed., Cambridge UP, 2013.
11. Jones, Leo. *Functions of English: Communication Practice in English*. Cambridge UP, 1981.
12. Kumar, Sanjay, and Pushp Lata. *Communication Skills*. 2nd ed., Oxford UP, 2018.
13. Lynch, Tony. *Listening in Language Learning*. Longman, 1988.
14. McCarthy, Michael, and Felicity O'Dell. *Academic Vocabulary in Use*. Cambridge UP, 2008.
15. Nordquist, Richard. *The Essentials of English Grammar*. McGraw-Hill Education, 2016.
16. Quirk, Randolph, et al. *A Comprehensive Grammar of the English Language*. Longman, 1985.
17. Seely, John. *The Oxford Guide to Writing and Speaking*. Oxford UP, 2005.
18. Straus, Jane, et al. *The Blue Book of Grammar and Punctuation*. 12th ed., Jossey-Bass, 2021.
19. Wallace, Catherine. *Reading*. Oxford UP, 1992.
20. Zinsser, William. *On Writing Well: The Classic Guide to Writing Nonfiction*. Harper Perennial, 2016.

Syllabus Committee:

Sr. No	Name of the Faculty	Designation and College	Signature
1.	Prof. (Dr.) Kailas Aute	Professor & Head, Dept. of English, Smt. CHM College	
2.	Prof. (Dr.) B. R. Hiramani,	(VC Nominee, University of Mumbai) Pancham Khemraj College, Sawantwadi	
3.	Prof. (Dr.) Vikas Raskar	(Subject Expert outside University) Hutatma Rajguru Mahavidyalay, Rajguru Nagar, Khed, (Affiliated to Savitribai Phule University)	
4.	Prof. (Dr.) Prashant Mothe	(Subject Expert outside University) Aadarsh Mahavidyalay, Umerga, Dharashiv, (Affiliated to Dr. Baba Saheb Ambedkar Marathwada University	
5.	Mr. Ananda Pandhare	Asst. Professor, Dept. of English, Smt. CHM College	
6.	Ms. Sana Khan	Asst. Professor, Dept. of English, Smt. CHM College	
7.	Dr. Micky Barua	Faculty Vidyalankar Institute of technology, Alumni Member	 MICKY BARUA
8.	Ms. Sofy Verghese	Accenture, Industry Representative	

Name & Signature of the Ad-hoc BoS Chairperson: Prof. (Dr). Kailas Aute 

Name & Signature of the Dean: Prof. (Dr). Nitin Arekar 

Smt. Chandibai Himathmal Mansukhani College

(Autonomous)

Second Year B.A

(Hindi)

Semester – III

Title : हिंदी भाषा : कौशल के आधार

Vertical - 5
Ability Enhancement Course 2 Credits

with effect from

Academic Year 2025-2026

Title : हिंदी भाषा : कौशल के आधार
Course Code : CHMAECHINIII

Sr.No.	Heading	Particulars
1.	Description of the Course :	विद्यार्थियों के लिए हिंदी एक सामान्य भाषा होने के साथ विशेष भाषा तब बन जाती है जब वह हिंदी के माध्यम से अपने कौशल में अभिवृद्धि करें, हिंदी के माध्यम से रोजगार के कई अवसरों को प्राप्त करें, इस दृष्टि से पाठ्यक्रम अत्यंत लाभवर्धक और उपयोगी सिद्ध होगा, हिंदी भाषा में कौशल विकास की असीम संभावनाएं हैं और कौशल के विभिन्न आयाम जुड़े हुए हैं जो अलग – अलग दिशाओं में देखे जा सकते हैं, पाठ्यक्रम विद्यार्थियों में लेखन, वाचन कौशल की अभिवृद्धि करने के साथ रोजगारपरक अवसर प्रदान करता है।
2.	Vertical : 5	AEC
3.	Type : Teaching Method	Theory + Practicum Lecture / Discussion / Presentation / Self Study, etc.
4.	Credit :	2 Credits
5.	Hours Allotted :	30 Hours
6.	Marks Allotted :	50 Marks
7.	Course Objectives : CO(A)1 : विद्यार्थियों को लेखन, वाचन कौशल का ज्ञज्ञन देना एवं रोजगार के अवसरों से जोड़ना। CO(A)2 : विद्यार्थियों को लेखन, वाचन कौशल से परिचय करते हुए अभिव्यक्ति की शैलियों का विकास करना। CO(A)3 : विद्यार्थियों को भाषण कला के विविध रूपों को समझाना, मौलिकता में अभिवृद्धि लाना एवं विशेषज्ञता दिलाना। CO(A)4 : विद्यार्थियों को श्रवण कौशल की विशेषताओं से परिचय कराते हुए श्रवण कौशल के लाभों से अवगत कराना।	

8.	Course Outcomes : CO1 : विद्यार्थियों का लेखन, वाचन कौशल के ज्ञान प्राप्ति के साथ मौलिक अभिव्यक्ति में बदलाव आएगा । CO2 : विद्यार्थियों का लेखन, वाचन कौशल द्वारा मानसिक विकास होगा, पठन शक्ति, शैली का विकास होगा । CO3 : विद्यार्थियों को लेखन, भाषण कौशल से भषिक – शक्ति, शैलियों का संवर्धन होगा विशेषज्ञता आएगी । CO4 : विद्यार्थियों को लेखन, वाचन, श्रावण, भाषण कौशल की विशेषताओं और उपयोगिता का ज्ञान प्राप्त होगा ।
9.	**Syllabus**
	UNIT I : हिंदी भाषा कौशल के आधार
	1.1 लेखन कौशल का अर्थ एवं स्वरूप लेखन कौशल की उपयोगिता एवं महत्व 1.2 लेखन कौशल की विधियाँ एवं विशेषताएँ 1.3 वाचन कौशल का अर्थ, स्वरूप एवं विशेषताएँ 1.4 वाचन कौशल की उपयोगिता एवं विधियाँ
	UNIT II : हिंदी भाषा कौशल के आधार
	2.1 भाषण कौशल का अर्थ एवं स्वरूप 2.2 भाषण कौशल का महत्व एवं उपयोगिता 2.3 भाषण कौशल की विधियाँ एवं विशेषताएँ 2.4 श्रवण कौशल का अर्थ, स्वरूप एवं विशेषताएँ 2.5 श्रवण कौशल का महत्व एवं उपयोगिता

10.

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

External Examination : Semester End External – 30 Marks Time : 1:00 Hour

Format of Question Paper

All Questions are Compulsory

मूल्यांकन प्रारूप	इकाई	अंक
<u>बाह्य मूल्यांकन</u> प्रश्न 1 : चार प्रश्नों में से किन्हीं दो प्रश्नों के उत्तर लिखिए ।	इकाई 1	15
प्रश्न 2 : चार प्रश्नों में से किन्हीं दो प्रश्नों के उत्तर लिखिए ।	इकाई 2	15 ☐
कुल अंक		**30**

मूल्यांकन प्रारूप	अंक
<u>आंतरिक मूल्यांकन</u> • AI Writing Tools की सहायता से हिंदी लेखन कौशल का अभ्यास, भाषा-संपादन, व्याकरण सुधार, सारांश लेखन एवं रचनात्मक लेखन करना। • AI की सहायता से दिए गए विषयों पर भाषण, लेख, संवाद एवं लघु-प्रस्तुति तैयार करना तथा भाषा, शैली एवं प्रभावशीलता का विश्लेषण करना। • AI Voice Tools का उपयोग करके हिंदी वाचन, भाषण, उच्चारण, स्वर, गति एवं प्रवाह का अभ्यास करना तथा AI आधारित Feedback प्राप्त करना। • AI Speech-to-Text एवं Text-to-Speech Tools की सहायता से श्रवण एवं वाचन कौशल विकसित करना तथा उच्चारण की शुद्धता का अभ्यास करना। • AI की सहायता से Reading Comprehension, प्रश्नोत्तर, शब्दार्थ, शब्दावली (Vocabulary) एवं भाषा-अभ्यास गतिविधियाँ तैयार करना। • AI आधारित Mock Interview, Group Discussion तथा Public Speaking गतिविधियों के माध्यम से भाषण एवं संप्रेषण कौशल विकसित करना। • AI की सहायता से हिंदी Podcast, Audio Narration एवं Listening Exercises तैयार करना तथा श्रवण कौशल का मूल्यांकन करना।	20
कुल अंक	**20**

11.	**संदर्भ ग्रंथ सूची –** 1. हिंदी भाषा शिक्षण के विविध आयाम – प्राध्यापक डॉ. राठौर, किनले एडिशन 2. अभिनव पत्र लेखन – डॉ. अनिल सिंह 3. हिंदी के व्यावहारिक रूप – डॉ. संतोष मोटवानी, परिदृश्य प्रकाशन, मुंबई 4. हिंदी भाषा लेखन कौशल – गुलीबाबा पब्लिकेशन प्राइवेट लिमिटेड

Bos in Hindi :

Sr No	Name of the Faculty	Designation and College
1.	Dr. Bhavna M.Rochlani	I/C HOD Asst. Professor CHM College Ulhasnagar
2.	Dr. Ajeet Kumar Rai	Associate Professor KC College Mumbai
3.	Dr. Santosh Motwani	Associate Professor RKT College Ulhasnagar

Name & Signature of the Ad-hoc BoS Chairperson –

Dr. Bhavna M. Rochlani : _____

Name & Signature of the Dean –

Dr. Nitin Arekar : _____

Smt Chandibai Himathmal Mansukhani College, Ulhasnagar (Autonomous)

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Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

Second Year BA/BCom/BSc/SFC
(Marathi)

Semester- III

Vertical -5
Ability Enhancement Course (AEC) -2 Credits

with effect from
Academic Year 2026-2027

Title: **लेखन कौशल्ये – १ (कार्यालयीन लेखनव्यवहार आणि पत्रव्यवहार)**

COURSE CODE: CHMAECMARIII

Sr. No.	Heading	Particulars
1	**Description the Course:**	**(कार्यालयीन लेखनव्यवहार आणि पत्रव्यवहार)** लेखन ओळख ते लेखन कौशल्य हा बराच मोठा प्रवास आहे. वाचन आणि लेखनाच्या सरावाने, लेखन कौशल्य विकसित करता येते. बहुतेक वेळा आपण मिळवलेले ज्ञान हे लिखित स्वरूपात मांडावे लागते. त्यासाठी आपण लेखन कौशल्याचे योग्य उपयोजन करतो. लेखने म्हणजे मजकूर तंतोतंत उतरवणे नव्हे. एखादे निवेदन, वृत्त, निबंध, पुस्तकाची टिपणे, अर्ज यांसाठी लेखन आवश्यक असते. कार्यालयीन पत्रव्यवहार, कार्यवृत्ते, नोंदी, जाहिरात, टिप्पणी ही सर्व उपयोजित लेखन कौशल्ये आहेत. कार्यालयीन पत्रव्यवहार करणे हे एक वेगळ्या प्रकारचे कौशल्य आहे. त्यातील काही उपयोजन कौशल्यांचा विचार या अभ्यासपत्रिकेत अपेक्षित आहे. कार्यालयीन लेखन व्यवहार आणि पत्रव्यवहार या अभ्यासपत्रिकेत शिकविला जाईल.
2	**Vertical 5**	Ability Enhancement Course
3	**Type**	Theory
4	**Credit**	2 Credits (1 Credit = 15 Hours for Theory or 30 Hours of Practical Work in a Semester)
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: **CO(A) 1:** कार्यालयीन लेखन व्यवहार स्वरूप समजावून सांगणे. **CO(A) 2:** कार्यालयीन पत्रव्यवहाराचे स्वरूप समजावून सांगणे,. **CO(A) 3:** प्रभावी कार्यालयीन लेखनासाठी आवश्यक असणाऱ्या क्षमता ऑणि तंत्रांचा परिचय करून देणे,	
8	**Course Outcomes**: प्रस्तुत अभ्यासक्रम शिकल्यानंतर: **CO1**: विद्यार्थ्यांना कार्यालयीन लेखन व्यवहाराचे स्वरूप समजेल, **CO2:** विद्यार्थ्यांना कार्यालयीन पत्रव्यवहाराचे स्वरूप समजेल. **CO3:** प्रभावी कार्यालयीन लेखनासाठी आवश्यक असणाऱ्या तंत्रांचा विद्यार्थ्यांना परिचय होईल.	

9

Syllabus

UNIT I कार्यालयीन लेखनव्यवहार

१. जाहीर निवेदन आणि माहितीपत्रक

२. इतिवृत्त लेखन

३. टिप्पणी लेखन

(६० मिनिटांच्या १५ तासिका, श्रेयांकन १)

(सूचना : विद्यार्थ्यांमध्ये उपरोक्त कार्यालयीन लेखन व्यवहार व पत्रव्यवहार करण्यासाठी आवश्यक कौशल्ये व क्षमता विकसित होतील या दृष्टीने शिक्षकांनी सराव करून घ्यावा.)

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UNIT II: कार्यालयीन पत्रव्यवहार

१. कार्यालयीन/प्रशासनिक पत्र

२. नोकरीसाठी अर्जलेखन

३. पत्रात्मक लेखन: नवी रूपे (शुभेच्छा, निमंत्रण)

(६० मिनिटांच्या १५ तासिका, श्रेयांकन-१)

(सूचना : विद्यार्थ्यांमध्ये उपरोक्त कार्यालयीन लेखन व्यवहार व पत्रव्यवहार करण्यासाठी आवश्यक कौशल्ये व क्षमता विकसित होतील या दृष्टीने शिक्षकांनी सराव करून घ्यावा.)

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

External Examination: Semester End External - 30 marks Time: 1:00 hours

Format of Question Paper

All questions are compulsory:

Q. No	Nature of Questions	Marks
Q1	Essay type question on Module 1	10
Q2	Essay type question on Module 2	10
Q6	MCQs 15 out of 20, 10 MCQs on each module	10
	Total 30	

Internal Examination: Continuous Evaluation - 20 marks

	Project and presentation / Viva	Marks
1.	• AI च्या साहाय्याने जाहीर निवेदन आणि माहितीपत्रक तयार करणे. त्यामध्ये शीर्षक, उद्दिष्ट, कार्यक्रमाचे वेळापत्रक, संपर्क इत्यादींची आकर्षक मांडणी करणे. • AI साधने वापरून सभेचे Audio/Video नुसार इतिवृत्त तयार करणे.	20

			त्यानंतर विद्यार्थ्यांनी त्यात आवश्यक ती सुधारणा करणे. • AI चा वापर करून कार्यालयीन टिप्पणी तयार करणे. त्यातील भाषा, रचना, औपचारिकता इत्यादींचे परीक्षण करून सुधारित टिप्पणी तयार करणे. • AI साधनांच्या माध्यमातून प्रशासनिक पत्रांचे विविध नमुनारूप तयार करणे. भाषेची औपचारिकता तपासणे. • AI साधनांच्या साहाय्याने नोकरीसाठी अर्ज तयार करणे. दिलेल्या जाहिरातीवर आधारित Cover Letter तयार करणे. • विविध प्रसंगांसाठी AI साधनांच्या आधारे निमंत्रणपत्र व शुभेच्छापत्र तयार करणे. **AI** साधने: ChatGPT, Google Gemini, Claude, Perplexity AI, NotebookLM, Canva, CapCut, InVideo, Grammarly, QuillBot, Whisper, ElevenLabs		
				Total 20	
11	**संदर्भ ग्रंथ (Reference Books) :** १. प्रशासनिक लेखन, भाषा संचालनालय, महाराष्ट्र शासन, मुंबई, १९६६ २. भाषिक सर्जन आणि उपयोजन, राजन गवस, अरुण शिंदे, गोमटेश्वर पाटील, दर्या प्रकाशन, पुणे, २०१२ ३. परब प्रकाश, व्यावहारिक मराठी, मिथुन प्रकाशन, डोंबिवली पूर्व, मुंबई, १९८९ ४. नाईक सदानंद, राजभाषा मराठी, व्यावहारिक मराठी, प्रका-नागरी सेवा प्रबोधिनी, मुंबई, २००२ ५. तावरे स्नेहल (संपा.), व्यावहारिक मराठी, स्नेहवर्धन प्रकाशन, पुणे, चौथी आवृत्ती, २०११ ६. केतकी मोडक, संतोष शेणई, सुजाता शेणई (संपा.), उपयोजित मराठी, पद्मगंधा प्रकाशन, २०१२ ७. नसीराबादकर ल. रा., व्यवहारिक मराठी, भाषा विकास संशोधन संस्था, कोल्हापूर २०२३				

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

First Year

Semester- III

Title: Cocurricular Course I

Vertical - 6
Cocurricular Course - 2 Credits

with effect from
Academic Year 2025-2026

Title: Cocurricular Course - I

Course Code: CHMCCI6

Sr. No.	Heading	Particulars
1	**Description the Course:**	This student-friendly Co-Curricular Course is uniquely designed to promote holistic development through active participation in various college-based activities. Unlike traditional theory-based subjects, this course emphasizes hands-on involvement and experiential learning. Students are encouraged to explore their interests and talents by engaging in cultural, social, literary, sports, extension, or club-based events conducted by the college throughout the academic year. Participation will be recorded and assessed based on involvement, initiative, team spirit, creativity, and consistency. The aim is to nurture essential life skills such as leadership, communication, collaboration, and responsibility in a supportive, informal setting. This non-theory course offers students the opportunities and the freedom to learn beyond the classroom and grow into well-rounded individuals, contributing positively to campus life and society.
2	**Vertical 6**	Cocurricular Course (Mandatory)
3	**Type** **Teaching Methods**	Non Theory Participation, Report Writing, Presentation etc.
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: 1. To inculcate a spirit of active participation in cultural, social, environmental, and creative activities. 2. To enhance personal and interpersonal skills through real-life experiences and teamwork. 3. To foster a sense of responsibility, leadership, and community engagement among students. 4. To develop self-confidence and emotional well-being through creative expression and collaboration. 5. To integrate classroom learning with experiential learning for holistic growth.	
8	**Learning Outcomes**: By the end of the course, students will be able to: **LO1:** Participate meaningfully in diverse co-curricular activities and reflect on their learning experiences. **LO2:** Demonstrate improved communication, leadership, and teamwork skills. **LO3:** Exhibit increased awareness of social responsibility and civic engagement. **LO4:** Build confidence through creative, cultural, and intellectual expressions. **LO5:** Maintain a portfolio or activity log to track participation and personal development.	

9	**Syllabus** **Unit I - Suggested Areas of Participation in the activities:** • **Cultural Events:** Drama, dance, music, literary events, debates, etc. • **Social Outreach:** Blood donation, awareness campaigns, cleanliness drives. • **Clubs & Societies:** Photography, quiz, environment club, shram club, etc. • **Sports & Fitness:** College tournaments, yoga, marathons, fitness challenges. • **Institutional Events:** Foundation Day, Annual Day, College Festivals, Intercollegiate events. • **National Festivals:** Independence Day, Republic Day etc. **Unit II - Program Specific Topics** • **Workshops/Seminars:** Report Writing, Personality Development, Soft Skills, Leadership Talks. • **Speak, Show, Shine:** Presentation / Poster Presentation / Viva and Learning Experience **Mode of Evaluation:** • **Faculty Coordinator:** To guide and evaluate student progress. • **Participation Proof:** Certificates, photos, attendance records. • **Reflective Journal:** Minimum 2–3 pages summarizing experiences, learning, and growth. • **Final Viva/Presentation:** 5-minute talk on poster presentation and on overall learning.
10	**Scheme of Examination and Assessment Pattern** **Based on 3 approved Activities** **Semester End External - 30 marks**

Activity No	Nature of Activities	Marks
1.	Title of Approved Activity - 1	10
2.	Title of Approved Activity - 2	10
3.	Title of Approved Activity - 3	10
	Total	**30**

Internal Examination: Continuous Evaluation – 20 marks

	Assessment / Evaluation	Marks
1.	Reflective journal	10
2.	Presentation/ poster presentation/viva	10
	Total	**20**

Suggested Readings:

- How to Win Friends and Influence People
- The 7 Habits of Highly Effective People
- Thinking, Fast and Slow
- Leaders Eat Last
- Talk Like Ted

Name & Signature of the Principal & Chairperson, Academic Council:

Dr. Manju Lalwani Pathak

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

Second Year B. Com.

Semester- III

Title: Field project

Vertical - 6
Field Project 2 Credits

with effect from
Academic Year 2025-2026

Title: Field Project

Course code:

Sr. No.	Heading	Particulars
1	**Description the Course:**	The Field Project course, introduced under CHM Autonomy in alignment with the NEP 2020, aims to bridge theoretical knowledge with practical experience. It provides students with hands-on exposure to real-world socio-economic contexts through field visits, observation, and analysis in both urban and rural settings. By engaging directly with development-related issues, students enhance their research, problem-solving, and analytical skills while fostering social responsibility and environmental awareness. The course ultimately prepares learners for employability and active participation in nation-building.
2	**Vertical 6**	Field Project
3	**Type & Teaching Methods**	Field work
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives:** 1. To connect theoretical learning with real-world socio-economic contexts through practical field experiences. 2. To develop analytical, problem-solving, and teamwork skills in addressing contemporary social issues. 3. To cultivate an appreciation for research and its role in promoting societal and national development.	
8	**Learning Outcomes:** **students will be able to:** **LO1**: Apply classroom knowledge to analyze real-life socio-economic challenges effectively. **LO2**: Demonstrate critical thinking, teamwork, and decision-making skills through field-based activities. **LO3**: Reflect on the relevance of research and experiential learning in contributing to social and national progress.	

9

Guidelines for Field Project

Following are the general guidelines for the conduct of Field Project (Semester III & IV)

Head of the Department (HOD)/ Field Project Co-ordinator

1. To ensure that FP program aligns with departmental and academic objectives as per NEP Structure within syllabus framework.
2. Appointment of field project incharges from the faculty of the department for group of Students.
3. To conduct orientation of FP Supervisor and decide the time line of the project.
4. To support the student for Filed Project.

FP Supervisor:

1. To give Guidelines for the field project.
2. To monitor student progress and provide guidance.

Project (Dissertation) Report:

Students are required to submit a report of the field project at the end of the semester in following suggested format.

The project should be typed on A4 sheets Font Size 12, Times New Roman, 1.5 line Spacing The project report shall have student details with signature of Field Project Incharge and photographs if any and it should be of minimum of 10 pages.

10

Scheme of Examination and Assessment Pattern

External Examination: Semester End External - 30 marks

Format of Question Paper

Nature of Evaluation	Marks
Field Project Report	30
	Total 30

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Involvement in Survey of Field Project /	05
2.	Field visit participation & completion	10
3.	Overall Impression	05
		Total 20

11	**Appendix I** **Attendance of the Student: Active Participation** I, the undersigned Ms / Mr._____ Roll No. ___ studying in the _____ Year of _____Full-time Course is doing my project work under the guidance of Dr./Ms./Mr. _____ _____ __, I wish to state that I have met my Internal guide on the following dates mentioned below for Project Guidance: - Sr.No. Date Signature of the Internal Guide _____ _____ _____ **Signature of the Candidate** **Signature of Field Project Supervisor**
	Appendix II **Name of the Department/College/Institute** **Certificate** I hereby certify that Mr./Ms. _____ Student of _____ studying in _____, has completed a project titled _____ _____ in the area of _____ specialization for the academic year 2025-2026 to the best of my knowledge the work of the student is original and the information included in the project is correct. _____ _____ **Field Project Supervisor** **Head of the Department/Principal**

Board of Examination

Principal & Chief Controller
Board of Examination

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

First Year

Semester - III

Title: Environmental Management and Sustainable Development-I

Vertical - 5
VEC Subject - 2 Credits

With effect from
Academic Year 2025-2026

Title: Environmental Management and Sustainable Development-I
Course Code: CHMVECI

Sr. No.	Heading	Particulars
1	**Description the Course:**	This course introduces students to the basics of environmental management and sustainable development. It explains how ecosystems work, the importance of biodiversity, and the need to protect our natural resources. Students will learn about different environmental problems, human impact on nature, and how to manage disasters. The course also covers Indian environmental movements, ethics, and the role of public awareness. Real-life examples and case studies help students understand the connection between nature and human communities in a simple and practical way.
2	**Vertical 5**	VEC
3	**Type & Teaching Methods**	Theory + Practicum Lectures/Discussions/Presentations/Case Studies, etc.
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: **CO(A)1:** To introduce about ecosystems, biodiversity and to make aware for the need of conservation. **CO(A)2:** To sensitize students towards environmental concerns, issues, and impacts of human population. **CO(A)3:** To analyze the impact of human population growth and development activities on the environment, including issues related to displacement, disaster response, and rehabilitation. **CO(A)4:** To foster awareness of environmental ethics and the role of cultural and social movements in shaping sustainable environmental practices through communication, policy, and activism.	
8	**Course Outcomes**: Student will be able to **CO1:** Explain the interrelationships within ecosystems and analyze energy flow and succession, using examples from various ecological zones. **CO2:** Critically evaluate biodiversity levels and conservation strategies, applying knowledge of endemic species, threats, and ecological services to real-world scenarios. **CO3:** Assess the socio-environmental implications of population growth, displacement, and disasters, incorporating case studies to understand sustainable development challenges. **CO4:** Demonstrate an understanding of environmental ethics and advocacy, by interpreting the influence of cultural values, environmental movements, and communication strategies on sustainability.	

9

Syllabus

UNIT I: Ecosystems, Biodiversity and Conservation

- Introduction, structure, and function of ecosystems; Energy flow: food chains, food webs and ecological succession. Case studies of the following:
  - Forest ecosystem
  - Grassland ecosystem
  - Desert ecosystem
  - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
- Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns.
- India as a mega-biodiversity nation; Endangered and endemic species of India.
- Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and informational value.

UNIT II: Human Communities and the Environment

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquake, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g. CNG vehicles in Delhi).

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

External Examination: Semester End External - 30 marks Time: 1:00 hours

Format of Question Paper

Attempt any 3 out of 4 questions.

Question No	Nature of Questions	Marks
Q1	Theory based on Unit I	10
Q2	Theory based on Unit I	10
Q3	Theory based on Unit II	10
Q4	Theory based on Unit II	10
TOTAL		**30**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Class Test, Creative writing/visits/role play (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Quiz)	10
2.	Project /Presentation / Viva/Group Discussion/Case study	10
TOTAL		**20**

11 **REFERENCES:**

1. Carson, R. (2002). *Silent Spring.* Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R. (1993). *This Fissured Land: An Ecological History of India*. University of California Press.
3. Gleeson, B., & Low, N. (Eds.). (1999). *Global Ethics and Environment*. Routledge.
4. Gleick, P. H. (1993). *Water in Crisis*. Pacific Institute for Studies in Development, Environment & Security; Stockholm Environment Institute; Oxford University Press.
5. Sodhi, N. S., Gibson, L., & Raven, P. H. (Eds.). (2013). *Conservation Biology: Voices from the Tropics*. John Wiley & Sons.
6. Thapar, V. (1998). *Land of the Tiger: A Natural History of the Indian Subcontinent*.
7. Warren, C. E. (1971). *Biology and Water Pollution Control*. W. B. Saunders.
8. Wilson, E. O. (2006). *The Creation: An Appeal to Save Life on Earth*. W. W. Norton.
9. Harper, Charles L. (2017). *Environment and Society: Human Perspectives on Environmental Issues* (6th Edition). Routledge.
10. Rajagopalan, R. (2011). *Environmental Studies: From Crisis to Cure*. Oxford University Press.
11. Harris, Frances (2012). *Global Environmental Issues* (2nd Edition). Wiley-Blackwell.

Name & Signature of the Dean &Ad-hoc BoS Chairperson (Interdisciplinary):

Dr. Nitin Arekar

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College, Ulhasnagar

(Autonomous)

Affiliated to the University of Mumbai

Bachelor of Science
(Botany)

Semester – IV

with effect from the
Academic Year 2026-2027

Smt. Chandibai Himathmal Mansukhani College

(Autonomous)

Second Year B.Sc.
(Botany)

Semester- IV

Title: Plant Science-II

Vertical - 1
Major Subject -2Credits

with effect from
Academic Year 2026-2027

Title: Plant Science-II

Course Code: CHMBOTIV1

Sr. No.	Heading	Particulars
1	**Description of the Course:**	This course provides a comprehensive study of plant structure and function. It includes the systematic position and life cycle of *Pinus*, detailed anatomical features of stems and needles, and the processes of normal secondary growth in dicot stems. Emphasis is placed on growth rings, periderm, lenticels, tyloses, and the organization of mechanical tissues. The physiology component focuses on photosynthetic mechanisms, including light reactions, cyclic and non-cyclic photophosphorylation, and carbon fixation through C_3 and C_4 pathways, highlighting the fundamental processes underlying plant growth and productivity.
2	**Vertical 1**	Major
3	**Type** **Teaching Methods**	Theory Lecture, Presentation, Seminars, Simulations
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: **CO(A)1:** To understand the systematic position, morphology, and life cycle of *Pinus* and its structural adaptations. **CO(A)2:** To study the anatomy of plant organs, emphasizing secondary growth, growth rings, periderm, lenticels, and tyloses. **CO(A)3:** To analyze the organization and function of mechanical tissues that provides strength and support in plants. **CO(A)4:** To explain the mechanisms of photosynthesis, including light reactions, cyclic and non-cyclic photo-phosphorylation, and carbon fixation pathways (C_3 and C_4). **CO(A)5:** To develop a comprehensive understanding of the relationship between plant structure and physiological function.	
8	**Course Outcomes**: After completing the course, students will be able to: **CO1:** describe the morphology, anatomy, and life cycle of *Pinus* and other gymnosperms. **CO2:** understand and identify key anatomical features such as secondary growth, growth rings, periderm, lenticels, and tyloses **CO3:** explain the role and arrangement of mechanical tissues in providing structural support to plants **CO4:** demonstrate an understanding of photosynthetic processes, including light reactions and carbon fixation pathways (C_3 and C_4 cycles).	

9

Syllabus

UNIT- I: Gymnosperm and Anatomy

1. Systematic position and life cycle of *Pinus*
   - (Morphology, T.S. of needle and stem Male and female cone)
2. Primary structure of dicot and monocot stem and root

- Normal secondary growth in dicot stem and root
- Growth rings, periderm, lenticels, tyloses
- Mechanical Tissue System
  - Tissues providing mechanical strength and support and their disposition
  - I-girders in aerial and underground organs
- Types of vascular bundles

UNIT–II: Plant Physiology

- Light Reaction: Cyclic and Non-cyclic Photophosphorylation
  - C_3 pathway/Calvin Cycle,
  - C_4pathway and its significance,
  - Crassulacean Acid Metabolism
- Photorespiration

Scheme of Examination and Assessment Pattern

Theory Paper – 50 Marks

External Examination: Semester End External - 30 marks Time: 1:00 hour

Format of Question Paper

Attempt all question

Question No	Questions	Marks
Q.1	Multiple Choice Question (Any five out of ten) 5 question from each unit	5
Q.2	Answer in one line (Any five out of ten) 5 question from each unit	5
Q.3	Attempt any one (out of two) unit-1	10
Q.4	Attempt any one (out of two) unit-2	10
TOTAL		**30**

Note

1. Equal weightage is to be given to all the units.
2. Use of simple calculator is allowed in the examination.
3. Wherever possible more importance is to be given to the practical problem**.**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
2.	Attendance/Viva-Voce	05
		Total 20

11	**REFERENCE**: 1. Pandey, B.P. (2016). *Plant Anatomy.* S. Chand & Company, New Delhi. 2. Eames, A.J. &MacDaniels, L.H. (2014). *An Introduction to Plant Anatomy.* McGraw-Hill Book Company, New York. 3. Esau, K. (2006). *Anatomy of Seed Plants.* John Wiley & Sons, New York. 4. Chamberlain, C.J. (1966). *Gymnosperms: Structure and Evolution.* University of Chicago Press. 5. Vashishta, P.C., Sinha, A.K. & Anil Kumar (2010). *Gymnosperms.* S. Chand & Company, New Delhi. 6. Fahn, A. (1990). *Plant Anatomy.* Pergamon Press, Oxford. 7. Salisbury, F.B. & Ross, C.W. (1992). Plant Physiology. Wadsworth Publishing, Belmont. 8. Taiz, L., Zeiger, E., Møller, I.M. & Murphy, A. (2018). Plant Physiology and Development. Sinauer Associates / Oxford University Press. 9. Hopkins, W.G. &Hüner, N.P.A. (2008). Introduction to Plant Physiology. John Wiley & Sons, New York. 10. Moore, R., Clark, W.D. & Vodopich, D.S. (1998). Botany. Wm. C. Brown Publishers. 11. Devlin, R.M. & Witham, F.H. (1983). Plant Physiology. CBS Publishers, New Delhi..

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

Second Year B.Sc.
(Botany)

Semester- IV

Title: Functional Botany-II

Vertical - 1
Major Subject – 2 Credits

with effect from
Academic Year 2026-27

Title: Functional Botany-II

Course Code: CHMBOTIV2

Sr. No.	Heading	Particulars
1	**Description the Course:**	This course explores the fundamentals of pharmacognosy, phytochemistry, and genetic engineering, focusing on natural drug sources, secondary metabolites, and herbal drug standardization. It also covers restriction enzymes, plasmid vectors, recombinant DNA technology, and the development of transgenic plants like Bt cotton and edible vaccines, emphasizing their applications in medicine and agriculture.
2	**Vertical 1**	Major
3	**Type** **Teaching Methods**	Theory Lecture, Presentation, Seminars, Simulations
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: **CO(A)1:** To understand the principles and significance of pharmacognosy and the use of pharmacopoeias in herbal drug standardization. **CO(A)2:** To study the sources, properties, and therapeutic applications of major secondary metabolites such as alkaloids, glycosides, tannins, and essential oils. **CO(A)3:** To identify and evaluate adulteration in crude drugs and ensure quality control of herbal materials. **CO(A)4:** To learn the basic tools and techniques of genetic engineering, including restriction enzymes, plasmid vectors, and recombinant DNA technology. **CO(A)5:** To explore the development and applications of transgenic plants such as Bt. cotton inedible vaccines in pharmaceutical and agricultural fields.	
8	**Course Outcomes:** After completing the course, students will be able to: **CO1**. interpret pharmacopeial standards and monographs for herbal drugs. **CO2**. classify and describe the pharmacological significance of major secondary metabolites. **CO3**. identify adulteration and ensure the quality control of crude drugs. **CO4**. explain the mechanisms and applications of restriction enzymes, plasmid vectors, and recombinant DNA technology. **CO5**. discuss the development and significance of transgenic plants in pharmaceutical and agricultural biotechnology.	

9

Syllabus

UNIT I: Pharmacognosy and Phytochemistry

1. Introduction to Pharmacopoeia, Study of Ayurvedic Pharmacopoeia of India
2. Study of Monograph from Pharmacopoeia
3. Secondary Metabolites: Sources, properties and uses of Alkaloids, Glycosides, Tannins and Essential oils
4. Study of Adulterants citing suitable examples

UNIT–II: Genetic Engineering

1. Restriction Endonuclease enzymes
2. Plasmid Vectors – Ti, pBR 322 and PUC 18
3. Recombinant DNA technology
4. Transgenic plants – Bt. cotton and edible vaccine

10

Scheme of Examination and Assessment Pattern

Theory Paper – 50 Marks

A. External Examination: Semester End External - 30 marks Time: 1:00 hours

Format of Question Paper

Attempt all questions.

Question No	Questions	Marks
Q.1	Multiple Choice Question (Any five out of ten) 5 questions from each unit	5
Q.2	Answer in one line (Any five out of ten) 5 question from each unit	5
Q.3	Attempt any one (out of two) unit-1	10
Q.4	Attempt any one (out of two) unit-2	10
TOTAL		**30**

Note

1. Equal weightage is to be given to all the units.
2. Use of simple calculator is allowed in the examination.
3. Wherever possible more importance is to be given to the practical problem**.**

A. Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
2.	Attendance/*Viva- Voce*	05
		Total 20

11	**REFERENCE :** 1. Anonymous. *The Ayurvedic Pharmacopoeia of India.* Government of India, Ministry of Health and Family Welfare, Department of AYUSH, New Delhi. 2. Anonymous. *The Indian Pharmacopoeia.* Indian Pharmacopoeia Commission, Ghaziabad, Govt. of India. 3. Kokate, C.K., Purohit, A.P. & Gokhale, S.B. (2017). *Pharmacognosy.* Nirali Prakashan, Pune. 4. Trease, G.E. & Evans, W.C. (2009). *Pharmacognosy.* Saunders/Elsevier, London. 5. Wallis, T.E. (1985). *Textbook of Pharmacognosy.* CBS Publishers & Distributors, New Delhi. 6. Evans, W.C. (2009). Trease and Evans Pharmacognosy. Elsevier, London. 7. Kokate, C.K., Purohit, A.P. & Gokhale, S.B. (2017). Pharmacognosy. Nirali Prakashan. 8. Mukherjee, P.K. (2002). Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons, New Delhi. 9. Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. &Losick, R. (2014). Molecular Biology of the Gene. Pearson Education. 10. Brown, T.A. (2016). Gene Cloning and DNA Analysis: An Introduction. Wiley-Blackwell. 11. Sambrook, J. & Russell, D.W. (2001). Molecular Cloning: A Laboratory Manual. Cold Spring Harbor Laboratory Press. 12. Singh, B.D. (2019). Biotechnology: Expanding Horizons. Kalyani Publishers, New Delhi. 13. Primrose, S.B. & Twyman, R.M. (2020). Principles of Gene Manipulation and Genomics. Wiley-Blackwell. 14. Glick, B.R., Pasternak, J.J. & Patten, C.L. (2010). M

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

Second Year B.Sc.
(Botany)

Semester- IV

Title: Practical Approaches in Plant Science II

Vertical - 1
Major Subject – 2 Credits

with effect from
Academic Year 2026-27

Title: Practical Approaches in Plant Science II
Course Code: CHMBOTIV3

Sr. No.	Heading	Particulars
1	Description of the Course:	This practical course is designed to provide hands-on experience in students in plant anatomy, physiology, phytochemistry, pharmacognosy, and basic biotechnology techniques. Through microscopic studies, experimental procedures, and field observations, students will develop the ability to relate theoretical concepts to practical understanding.
2	Vertical 1	Major
3	Type Teaching Methods	Practicum
4	Credit	2 Credits
5	Hours allotted	60 Hours
6	Marks allotted	50 Marks
7	**Course Objectives:** **CO(A)1:** To study the anatomical and reproductive features of *Pinus* by examining the transverse and longitudinal sections of needles, stems, and cones, in order to understand its life cycle and structural adaptations. **CO(A)2:** To understand the phenomenon of normal secondary growth and to analyze the organization, distribution, and role of different types of mechanical tissues in both aerial and underground organs. **CO(A)3:** To examine the structure and function of conducting tissues (xylem and phloem) through maceration techniques and to study various types of vascular bundles for understanding plant transport systems. **CO(A)4:** To familiarize students with molecular cloning tools through the identification and study of commonly used vectors such as pBR322, pUC18, and Ti plasmid. **CO(A)5:** To perform preliminary phytochemical analyses for the detection of major plant metabolites such as alkaloids, tannins, and glycosides, and to identify adulterants in crude drug samples. **CO(A)6:** To conduct selected physiological and biochemical experiments (e.g., Hill reaction, diurnal acid fluctuation in CAM plants, seed germination studies) and to gain practical exposure through field or industrial visits.	

8

Course Outcomes: After completing the course, students will be able to:

CO1: identify and describe the structural features and reproductive organs of *Pinus*.

CO2: explain and observe normal secondary growth and the organization of plant tissues in dicot and monocot stem and root.

CO3: differentiate types of mechanical and vascular tissues and understand their functional roles.

CO4: conduct basic phytochemical tests and detect adulterants in crude drugs.

CO5: recognize key molecular biology tools used in genetic engineering.

CO6: perform selected plant physiology experiments to understand photosynthesis and respiration.

9

Syllabus

1. Study of stages in the life cycle of *Pinus* (T.S. of needle, T.S., T.L.S. and R.L.S. of stem, Male and female cone) from fresh/preserved material and permanent slides.
2. Primary structure of dicot stem and root
3. Primary structure of monocot stem and root
4. Study of normal secondary growth in stem.
5. Types of mechanical tissues,
6. Mechanical tissue system in aerial organ
7. Mechanical tissue system in underground organs
8. Study of conducting tissues – Xylem and Phloem through maceration technique.
9. Study of different types of vascular bundles.
10. Identification of the cloning vectors – pBR- 322; pUC- 18; Ti – plasmid
11. Preliminary phytochemical tests for Alkaloids, Tannins and Glycosides
12. To detect adulterants from the given samples.
13. Study of Monograph.
14. Q10 – germinating seeds using Phenol Red indicator.
15. Study of Hill reaction.
16. Determination of Diurnal acid fluctuation in CAM plants.
17. Field Visit/Industrial visit

Scheme of Examination and Assessment Patten

Theory Paper- 50 Marks

External Examination: Semester End External- 30 Marks Time: 2 hrs.

Format of Question Paper

Question No	Questions	Marks
Q1	Practical	10
Q2	Practical	10
Q3	Identification	05
Q4	Journal	05
	TOTAL	30

Internal Examination: Continuous Evaluation-20 Marks

	Assessment/ Evaluation	Marks
1.	Continuous evaluation through Project/Survey/Field Visit/Industrial Visit/Seminar	10

	2.	Report of the same	05
	3.	*Viva-Voce*	05
		TOTAL	20
11.	REFERENCES: 1. Harborne, J.B. (1973). Phytochemical Methods. John Wiley & Sons. New York 2. Khandelwal, K.R. (2017).Practical Pharmacognosy: Techniques and Experiments. Nirali Prakashan, Pune. 3. Pandey, B.P. (2016). Practical Botany – Vol. I & II. Publisher: S. Chand & Company, New Delhi. 4. Cutt, J.R. & Curtis, R.W. (1998). Practical Plant Anatomy. Publisher: Oxford University Press. 5. Moore, T.C. (1979). Research Experiences in Plant Physiology: A Laboratory Manual. Publisher: Springer-Verlag, New York. 6. An introduction to practical Biochemistryby Plummer, David T. (2017) London ; New York : McGraw-Hill		

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

Second Year B.Sc.
(Botany)

Semester- IV

Title: Functional Botany-III

Vertical - 2
Minor Subject – 2 Credits

with effect from
Academic Year 2026-27

Title: Functional Botany-III

Course Code: CHMBOTIV4

Sr. No.	Heading	Particulars
1	**Description the Course:**	This course explores the fundamentals of pharmacognosy, phytochemistry, and genetic engineering, focusing on natural drug sources, secondary metabolites, and herbal drug standardization. It also covers restriction enzymes, plasmid vectors, recombinant DNA technology, and the development of transgenic plants like Bt cotton and edible vaccines, emphasizing their applications in medicine and agriculture.
2	**Vertical- 2**	Minor
3	**Type** **Teaching Methods**	Theory Lecture, Presentation, Seminars, Simulations
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: **CO(A)1:** To understand the principles and significance of pharmacognosy and the use of pharmacopoeias in herbal drug standardization. **CO(A)2:** To study the sources, properties, and therapeutic applications of major secondary metabolites such as alkaloids, glycosides, tannins, and essential oils. **CO(A)3:** To identify and evaluate adulteration in crude drugs and ensure quality control of herbal materials. **CO(A)4:** To learn the basic tools and techniques of genetic engineering, including restriction enzymes, plasmid vectors, and recombinant DNA technology. **CO(A)5:** To explore the development and applications of transgenic plants such as Bt. Cotton and edible vaccines in pharmaceutical and agricultural fields.	
8	**Course outcomes (Cos):** After completion of course, students will be able to: **CO1:** Interpret pharmacopoeia standards and monographs for herbal drugs. **CO2:**. Classify and describe the pharmacological significance of major secondary metabolites. **CO3:** Identify adulteration and ensure the quality control of crude drugs. **CO4:** Explain the mechanisms and applications of restriction enzymes, plasmid vectors, and recombinant DNA technology. **CO5:** Discuss the development and significance of transgenic plants in pharmaceutical and agricultural biotechnology.	

9

Syllabus

UNIT I: Pharmacognosy and Phytochemistry

1. Introduction to Pharmacopoeia study of Ayurvedic Pharmacopoeia of India
2. Study of Monograph from Pharmacopoeia
3. Secondary Metabolites: Sources, properties and uses of Alkaloids, Glycosides, Tannins and Essential oils
4. Study of Adulterants citing suitable examples

UNIT–II: Genetic Engineering

1. Restriction Endonuclease enzymes
2. Plasmid Vectors – Ti, pBR 322 and PUC 18
3. Recombinant DNA technology
4. Transgenic plants – Bt. cotton and edible vaccine

10

Scheme of Examination andAssessment Pattern

Theory Paper – 50 Marks

A. External Examination: Semester End External - 30 marks Time: 1:00 hours

Format of Question Paper

Attempt all questions.

Question No	Questions	Marks
Q1.	MCQs type question (Any five out of ten) 5 questions from each unit.	5
Q2.	Answer in one line (Any five out of ten) 5 questions from each unit.	5
Q3.	**Answer any one (out of two). Unit-1**	10
Q4.	**Answer any one (out of two). Unit-1**	10
TOTAL		**30**

Note

1. Equal weightage is to be given to all the units.
2. Use of simple calculator is allowed in the examination.
3. Wherever possible more importance is to be given to the practical problem**.**

A. Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
2.	Attendance/*Viva- Voce*	05
		Total 20

11	**REFERENCE :** 1. Anonymous. *The Ayurvedic Pharmacopoeia of India.*Government of India, Ministry of Health and Family Welfare, Department of AYUSH, New Delhi. 2. Anonymous. *The Indian Pharmacopoeia.* Indian Pharmacopoeia Commission, Ghaziabad, Govt. of India. 3. Kokate, C.K., Purohit, A.P. &Gokhale, S.B. (2017). *Pharmacognosy.* Nirali Prakashan, Pune. 4. Trease, G.E. & Evans, W.C. (2009). *Pharmacognosy.* Saunders/Elsevier, London. 5. Wallis, T.E. (1985). *Textbook of Pharmacognosy.* CBS Publishers & Distributors, New Delhi. 6. Evans, W.C. (2009). Trease and Evans Pharmacognosy. Elsevier, London. 7. Kokate, C.K., Purohit, A.P. &Gokhale, S.B. (2017). Pharmacognosy. Nirali Prakashan. 8. Mukherjee, P.K. (2002). Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons, New Delhi. 9. Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. &Losick, R. (2014). Molecular Biology of the Gene. Pearson Education. 10. Brown, T.A. (2016). Gene Cloning and DNA Analysis: An Introduction. Wiley-Blackwell. 11. Sambrook, J. & Russell, D.W. (2001). Molecular Cloning: A Laboratory Manual. Cold Spring Harbor Laboratory Press. 12. Singh, B.D. (2019). Biotechnology: Expanding Horizons. Kalyani Publishers, New Delhi. 13. Primrose, S.B. &Twyman, R.M. (2020). Principles of Gene Manipulation and Genomics. Wiley-Blackwell. 14. Glick, B.R., Pasternak, J.J. & Patten, C.L. (2010). M

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

Second Year B.Sc.
(Botany)

Semester- IV

Title: Practical Approaches of Functional Botany-III

Vertical - 2
Minor Subject – 2 Credits

with effect from
Academic Year 2026-27

Title: Practical Functional Botany-III
Course Code: CHMBOTIV5

Sr. No.	Heading	Particulars
1	Description of the Course:	This course offers hands-on training in key pharmacognosy and biotechnology techniques, including identification of powder characteristics of herbal drugs, maceration study of xylem and phloem, and basic phytochemical tests for alkaloids, tannins, and glycosides. Students learn adulterant detection, study plant monographs, observe essential oil extraction using a Clevenger apparatus, and perform TLC of selected oils. The course also introduces major cloning vectors (pBR322, pUC18, Ti plasmid) and the principles of Sanger DNA sequencing, complemented by field or industrial visits for practical exposure.
2	**Vertical -2**	Minor
3	**Type Teaching Methods**	Practicum
4	**Credit**	2 Credits
5	**Hours allotted**	60 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives:** **CO(A)1:** To develop the ability to identify herbal drugs through their powder characteristics and anatomical features. **CO(A)2:** To impart practical skills in phytochemical screening, essential oil extraction, and quality evaluation of crude drugs. **CO(A)3:** To introduce fundamental biotechnological tools including cloning vectors and DNA sequencing methods. **CO(A)4:** To provide real-world exposure to pharmacognosy and biotechnology practices through field or industrial visits.	
8	**Course Outcomes (Cos):** After completion of course, students will be able to: **CO1:** accurately identify herbal drugs and detect adulterants using microscopic and analytical techniques. **CO2:** gain hands-on proficiency in phytochemical tests, maceration studies, essential oil extraction, and TLC analysis. **CO3:** understand the structure and applications of key cloning vectors and the principles of Sanger DNA sequencing. **CO4:** apply classroom knowledge to real-world settings through field or industrial exposure, enhancing practical and professional skills.	

9

Syllabus

1. Powder characteristics of herbal drug (Trichomes/Stomata/Stone cells etc.).
2. Study of conducting tissues – Xylem and Phloem through maceration technique.
3. Preliminary phytochemical tests for Alkaloids, Tannins and Glycosides.
4. To detect adulterants from the given samples.
5. Study of Monograph (Ocimum sanctum/Ecliptaalba).
6. Demonstration: Extraction of essential oil using Clevenger
7. TLC for essential oil (Patchouli / Citronella).
8. Identification of the cloning vectors – pBR- 322; pUC- 18; Ti – plasmid
9. Sequencing of DNA by Sangers Method
10. Field Visit/Industrial visit

10

Scheme of Examination and Assessment Patten
Theory Paper- 50 Marks
External Examination: Semester End External- 30 Marks Time: 2 hrs.
Format of Question Paper

Question No	**Questions**	**Marks**
Q1	Practical	10
Q2	Practical	10
Q3	Identification	05
Q4	Journal	05
	TOTAL	30

Internal Examination: Continuous Evaluation-20 Marks

	Assessment/ Evaluation	Marks
1.	Continuous evaluation through Project/Survey/Field Visit/Industrial Visit	10
2.	Report of the same	05
3.	*Viva-Voce*	05
	TOTAL	20

11.	**REFERENCES:** 1. Harborne, J.B. (1973). Phytochemical Methods. John Wiley & Sons. New York 2. Khandelwal, K.R. (2017).Practical Pharmacognosy: Techniques and Experiments. Nirali Prakashan, Pune. 3. Pandey, B.P. (2016). Practical Botany – Vol. I &II.Publisher: S. Chand & Company, New Delhi. 4. Cutt, J.R. & Curtis, R.W. (1998). Practical Plant Anatomy.Publisher: Oxford University Press. 5. Anonymous. The Ayurvedic Pharmacopoeia of India. Government of India, Ministry of Health and Family Welfare, Department of AYUSH, New Delhi.

HSNC Board's
Smt. Chandibai Himathmal Mansukhani College
(Autonomous)
(Affiliated to the University of Mumbai)
University College Code: 217 | JD Office: T14

Estd. Year 1965

Faculty of Interdisciplinary

List of Skill Based Open Electives for Second Year: Semester – IV

Sr. No.	Semester IV Subject
1	Digital Interface, Web Design And Publishing
2	3D Modeling And Character Animation Fundamentals
3	Advance Tools Of AI For Economics And Education - II
4	English For Leadership and Strategic Communication
5	Urbanization And Real Estate: Applied Urban Planning, Design And Sustainable Cities
6	Travel Agency And Tour Operators Business
7	Managing Family Wealth Through Family Office-IV
8	Advanced Web Designing &Amp; Portfolio Development
9	Basics Of Nutrition - 4
10	Reel Strategy And Influencer Management
11	Preforming Art- Dance-4
12	Data Analysis Project Based Approach
13	Strategic Political Communication, Digital Governance And AI-Driven Public Engagement Skills
14	Psychology Of Personal Relationship-II
15	Digital Society And Social Change
16	Mushroom Cultivation Training And Trading Level 4
17	Pranayama And Yogic Breathing Practices
18	Perfumery Course Level 4
19	Career Launchpad: Communication And Employability Skills
20	Beautician: Strategic Business Planning -IV
21	Current Trends In Fashion Designing: Financial Perspective Level 4
22	Basics Of Accounting-IV
23	Digital Marketing -IV
24	Online Trading For Investment Management

Smt. Chandibai Himathmal Mansukhani College, Ulhasnagar (Autonomous)

P.B. No 17, Opp. Railway Station, Smt. Chandibai Himathmal Mansukhani Road, Ulhasnagar- 421003, Dist. Thane, (MAHARASHTRA)
Tel. : +91 251 273 4940 • Telefax + 91 251 273 1869 • E-mail: principal.chmc@gmail.com • Website: www.chmcollege.in

Smt. Chandibai Himathmal Mansukhani College

(Autonomous)

Second Year B.Sc.
(Botany)

Semester- IV

Title: Plant Tissue Culture

Vertical - 4
Vocational Skills Course -2 Credits

with effect from
AcademicYear2026-2027

Title: Plant Tissue Culture

Course Code: CHMBOTIV7

Sr. No.	Heading	Particulars
1	**Description of the Course:**	This course offers practical training in plant tissue culture techniques, focusing on sterilization procedures, media preparation, and explant inoculation. Students will gain experience in callus induction and plant regeneration. Hands-on activities include designing a tissue culture laboratory, preparing synthetic seeds, and participating in a visit to a tissue culture laboratory and Greenhouse. By the end of the course, students will develop key competencies essential for careers in plant tissue culture and commercial micropropagation.
2	**Vertical- 4**	VSC
3	**Type** **Teaching Methods**	Practicum
4	**Credit**	2 Credits
5	**Hours allotted**	60 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: **CO(A)1:** To get exposure to principles and techniques of plant tissue culture and apply these studies for improving agriculture and horticulture and to become an entrepreneur. **CO(A)2:** To familiarize students with the organization, layout, and functional requirements of a plant tissue culture laboratory. **CO(A)3:** To provide hands-on experience in various sterilization techniques essential for maintaining aseptic conditions. **CO(A)4:** To develop proficiency in the preparation of stock solutions and preparation of culture media for plant tissue culture. **CO(A)5:** To train students in seed sterilization, *in vitro* germination, and regeneration of plants from callus tissue. **CO(A)6:** To introduce micropropagation techniques and encapsulation methods for synthetic seed production. **CO(A)7:** To enhance understanding of practical applications through exposure visits to greenhouse/polyhouse facilities.	

8	**Course Outcomes**: After completing the course, students will be able to: **CO1:** understand the design, equipment, and safety measures required for organizing a plant tissue culture laboratory. **CO2:** develop competence in performing wet, dry, chemical, and ultrafiltration sterilization methods and operate and maintain laminar air flow cabinets for aseptic work. **CO3:** accurately calculate and prepare stock solutions and Murashige and Skoog (MS) medium components and learn troubleshoot common issues related to media preparation and contamination. **CO4:** perform seed sterilization and establish *in vitro* cultures for seed germination and to induce callus formation and regenerate complete plants. **CO5:** learn micropropagation techniques for large-scale multiplication of plantlets and to encapsulate axillary buds or embryos to produce synthetic seeds. **CO6:** gain insight into real-world applications of plant tissue culture through visits to greenhouses or polyhouses.
9	**Syllabus** **1.** Study of plant Tissue Culture Laboratory organization. **2.** Various sterilization techniques- a) Wet sterilization • Dry sterilization • Laminar Air Flow • Chemical sterilization • Ultrafiltration **3.** Problems based on preparation of stock solutions for plant tissue culture media. **4.** Preparation of Stock solutions for MS medium. **5.** Preparation of MS medium. **6.** Seed sterilization and *in vitro* seed germination. **7.** Callus induction and regeneration. **8.** Study of Micropropagation technique. **9.** Encapsulation of axillary bud/embryo. **10.** Visit to Greenhouse /Polyhouse

10

Scheme of Examination and Assessment Pattern

Practical Paper – 50 Marks

External Examination: Semester End External - 30 marks Time: 1:00 hour

Format of Question Paper

Question No	Questions	Marks
Q1	Practical	10
Q2	Practical	10
Q3	Identification	05
Q4	Journal	05
	TOTAL	30

Internal Examination: Continuous Evaluation - 20 marks

	Assessment/ Evaluation	Marks
1.	Continuous evaluation through Project/Survey/Field Visit/Industrial Visit/seminar	10
2.	Report of the same	05
3.	*Viva-Voce*	05
	TOTAL	20

Botany BOS Committee:

Sr No	Name of the Faculty	Designation and College
1.	Dr. Lal Sahab Yadav	**Head of Department & Chairperson BOS**
2.	Prof. Anil Avhad	**Subject Expert VC Nominee Mumbai University** **R. J. College, Ghatkopar Mumbai**
3.	Prof. K.N. Borse	**Subject Expert from outside the parent University** **SSVVPS Science College Dhule**
4.	Dr. Suvarna Sharma	**Subject Expert from outside the parent University** **K. C. College, Charch Gate Mumbai**
5.	Mr. Prashant Patil	**Smt. CHM College**
6.	Dr. Darshana Patil	**Smt. CHM College**
7.	Dr. Lakshmi Girish	**Smt. CHM College**
8.	Dr. Satish Mourya	**Industry Representative Alumni** **Hi-Media, Thane**
9.	Dr. Rajani Shirshat	**Alumni** **V.Z. Kelkar College, Mulund**

Members of Botany Department

Sr. No	Name of the Faculty	Designation and College	Signature
1.	Dr. Lal Sahab Yadav	Head & Associate Professor Smt. CHM College, Ulhasnagar	
2	Mr. Prashant Patil	Assistant Professor Smt. CHM College, Ulhasnagar	
3	Dr. Darshana Patil	Associate Professor Smt. CHM College, Ulhasnagar	
4	Dr. Lakshmi Girish	Associate Professor Smt. CHM College, Ulhasnagar	

Name & Signature of the BoS Chairperson: DR. LALSAHAB YADAV

Name & Signature of the Dean: Dr. NEENA ANAND

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

Second Year

Semester - IV

Title: Environmental Management and Sustainable Development - II

Vertical - 5
VEC Subject - 2 Credits

with effect from
Academic Year 2025-2026

Title: Environmental Management and Sustainable Development - II

Course Code: CHMVEC2

Sr. No.	Heading	Particulars
1	**Description the Course:**	This course examines the relationship between environmental pollution and human health, with detailed coverage of air, water, soil, noise, thermal, and radioactive pollution and their sources, standards, and impacts. It enables learners to understand pollution generation processes, waste management challenges, and the assimilative capacity of the environment. The course also introduces environmental laws, constitutional provisions, and regulatory frameworks, along with tools such as Environmental Management Systems (ISO 14001), life cycle analysis, and cost–benefit analysis. Emphasis is placed on sustainable practices, pollution control measures, the 3R concept, ecolabeling, and global initiatives such as the Sustainable Development Goals and Mission LiFE.
2	**Vertical 5**	VEC
3	**Type & Teaching Methods**	Theory + Practicum Lectures/Discussions/Presentations/Case Studies, etc.
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: **CO(A)1:** To develop a comprehensive understanding of various types of environmental pollution, their sources, standards, and impacts on human health and ecosystems. **CO(A)2:** To familiarize students with environmental laws, constitutional provisions, and regulatory frameworks related to environmental protection and management. **CO(A)3:** To equip learners with knowledge of environmental management tools, pollution control measures, and sustainable waste management practices. **CO(A)4:** To create awareness about global and national sustainability initiatives such as the Sustainable Development Goals, Mission LiFE, and their role in achieving sustainable development.	

8	**Course Outcomes**: Student will be able to **CO1**: Identify and analyze different types of environmental pollution and assess their impacts on human health and ecological systems. **CO2**: Explain key environmental laws, constitutional provisions, and institutional mechanisms for environmental protection. **CO3**: Apply environmental management tools and sustainable waste management practices in real-world contexts. **CO4**: Evaluate sustainability initiatives such as the SDGs and Mission LiFE and relate them to environmental management and sustainable development practices.
9	**Syllabus** **UNIT I: Environmental Pollution and Health** • Understanding pollution: Production processes and generation of wastes; Assimilative capacity of the environment; Definition of pollution; Point sources and non-point sources of pollution. • Air pollution: Sources of air pollution; Primary and secondary pollutants; Indoor air pollution; Adverse health impacts of air pollutants; National Ambient Air Quality Standards. • Water pollution: Sources of water pollution; River, lake and marine pollution, groundwater pollution; water quality parameters and standards; adverse health impacts of water pollution on human and aquatic life. • Soil pollution and solid waste: Soil pollutants and their sources; Solid and hazardous waste; Impact on human health. • Noise pollution: Definition of noise; Unit of measurement of noise pollution; Sources of noise pollution; Noise standards; adverse impacts of noise on human health. • Thermal and Radioactive pollution: Sources and impact on human health and ecosystems. **UNIT II: Environmental Management** • Introduction to environmental laws and regulation: Constitutional provisions- Article 48A, Article 51A (g) and other derived environmental rights; • Introduction to environmental legislations on the forest, wildlife and pollution control. Environmental management system: ISO 14001 Life cycle analysis; Cost-benefit analysis • Pollution control and management; Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability; Ecolabeling /Ecomark scheme. • Introduction to Millennium Development Goals, Sustainable Development Goals, & Mission Life.

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

External Examination: Semester End External - 30 marks Time: 1:00 hours

Format of Question Paper

Attempt any 3 out of 4 questions.

Question No	Nature of Questions	Marks
Q1	Theory Question based on Unit I	10
Q2	Theory Question based on Unit I	10
Q3	Theory Question based on Unit II	10
Q4	Theory Question based on Unit II	10
TOTAL		**30**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Assignment / Project	10
2.	Case Study / Assignment	10
TOTAL		**20**

11

REFERENCES:

1. Barrow, C. J. (2012). *Environmental management for sustainable development* (2nd ed.). Routledge.
2. Doabia, T. S. (2023). *Environmental and pollution laws in India* (4th ed.). Eastern Book Company.
3. Kumar, S. (2009). *Environmental policies in India*. Northern Book Centre.
4. Rajagopalan, R. (2023). *Environmental studies* (4th ed.). Oxford University Press India.
5. Rogers, P. P., Jalal, K. F., & Boyd, J. A. (2007). *An introduction to sustainable development*. Earthscan.
6. Singh, J., Singh, A., & Gupta, S. (2019). *Environmental science and engineering*. New Age International Publishers.

Sr No	Name of the Faculty	Designation and College	Signature
1.	Dr. Sunil Lalchandani	Dean, Faculty of Interdisciplinary	

SMT. CHANDIBAI HUMATHMAL MANSUKHANI COLLEGE ★ ULHASNAGAR 421 003.

Smt. Chandibai Himathmal Mansukhani College

(Autonomous)

Second Year B.A

(Hindi)

Semester – IV

Title : हिंदी भाषा : व्यावहारिक प्रयोग

Vertical - 5

AEC – 2 Credits

with effect from

Academic Year 2025-2026

Title : हिंदी भाषा : व्यावहारिक प्रयोग
Course Code : CHMAECHINIV

Sr.No.	Heading	Particulars
1.	Description of the Course :	भाषा का जीवन में सदैव महत्व रहा है, जीवन और भाषा का चोली – दामन का संबंध है, जब हमारी भाषा मधुर और सार्थक होती है तो श्रेता पर विशिष्ट प्रभाव पड़ता है, भाषा का यदि सही और सार्थक रूप से प्रयोग किया जाए तो मुनष्य जीवन में कहीं भी असफल नहीं हो सकता है, इसी भाषा के माध्यम से हम सभी को अपनी ओर आकर्षित भी करते है, वर्तमान युग में रोजगार में बहुत से क्षेत्र भाषा से जुड़े हुए है, जिसके माध्यम से विद्यार्थी इनका लाभ ग्रहण कर सकते है, भाषाई क्षमता हमारे विचारों की संवाहक होती है, आज डिजिटल युग में अभिव्यक्ति के कई माध्यमों का प्रसार हुआ है, इन माध्यमों में भाषा ही सशक्त तत्व है जो आपकी अभिव्यक्ति को पूरे जगत को अवगत कराती है, भाषा का महत्व हर समय, हर माध्यम में रहा है, परंतु भाषा का सार्थक रूप का प्रयोग आज बहुत आवश्यक है। आज हिंदी अंतरराष्ट्रीय स्तर पर प्रयोग में लाई जा रही है, तकनीक, सूचना प्रौद्योगिकी सोशल मीडिया, राजनीति की भाषा हिंदी बन चुकी है, जीवन में कई क्षेत्रों में व्यावहारिक स्तर पर हमें अपनी भाषा के लिखित स्वरूप के कार्यो को करना होता है और ऐसे में कार्य-दक्ष्ता महत्व रखती है, हिंदी भाषा में व्यावहारिक प्रयोग को केंद्र में रखकर और इन्हीं पहलूओं को ध्यान में रखते हुए इस पाठ्यक्रम का गठन किया गया है, हम हिंदी भाषा को सही और शुद्ध रूप में प्रयोग कर अभिव्यक्ति को सफल बनाए और बिना व्याकरण के यह संभव नहीं है, इस दृष्टि से पाठ्यक्रम सर्वाधिक लाभकारी सिद्ध होगा
2.	Vertical : 5	AEC
3.	Type : Teaching Methods :	Theory + Practium Lecture / Discussion / Presentation / Self Study, etc.

4.	**Credit :**	2 Credits (1 Credit = 15 Hours for Theory)
5.	**Hours Allotted :**	30 Hours
6.	**Marks Allotted :**	50 Marks
7.	**Course Objectives :** **CO(A)1:** विद्यार्थियों को राजभाषा हिंदी का विधिवत ज्ञान प्रदान करना । **CO(A)2:** विद्यार्थियों को राजभाषा हिंदी के संवैधानिक महत्तव से परिचित करवाना । **CO(A)3:** विद्यार्थियों को संज्ञा आदि का ज्ञान प्रदान करना। **CO(A)4:** विद्यार्थियों को कारकों, वाक्य रचना एवं भाषिक चिन्हों आदि का ज्ञान प्रदान करना ।	
	Course Outcomes : **CO1 :** विद्यार्थियों को राजभाषा हिंदी का ज्ञान प्राप्त होगा, एवं दक्षता प्राप्त होगी । **CO2 :** विद्यार्थियों को राजभाषा हिंदी के संवैधानिक महत्तव की जानकारी प्राप्त होगी । **CO3 :** विद्यार्थियों को हिंदी – संज्ञा आदि का ज्ञान प्राप्त होने के साथ भाषा के शुद्ध, व्यावहारिक रूप का ज्ञान होगा । **CO4 :** विद्यार्थियों को कारकों, वाक्य रचना एवं भाषिक चिन्हों आदि का ज्ञान प्राप्त होगा ।	
9.	**Syllabus**	
	UNIT I :	
	1. हिंदी भाषा – सामान्य परिचय	
	2. राजभाषा हिंदी – संवैधानिक महत्तव	
	3. वर्णमाला – स्वर एवं व्यंजन	
	4. शब्द भेद – सामान्य परिचय (संज्ञा आदि)	
	UNIT II :	
	1. वाक्य – सामान्य परिचय	
	2. वर्तनी – शुद्धता का प्रयोग एवं सावधानियाँ	
	3. कारक एवं विराम चिन्ह	
	4. निबंध लेखन – (सामाजिक निबंध, आत्मकथात्मक निबंध, समसामायिक निबंध)	

10.

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

External Examination : Semester End External – 30 Marks Time : 1:00 Hours

Format of Question Paper

All Questions are Compulsory

मूल्यांकन प्रारूप	इकाई	अंक
<u>बाह्य मूल्यांकन</u> प्रश्न 1 : चार प्रश्नों में से किन्हीं दो प्रश्नों के उत्तर लिखिए। प्रश्न 2 : चार प्रश्नों में से किन्हीं दो प्रश्नों के उत्तर लिखिए।	इकाई 1 इकाई 2	15 15
	कुल अंक	**30**

मूल्यांकन प्रारूप	अंक
<u>आंतरिक मूल्यांकन</u> • AI की सहायता से हिंदी भाषा, राजभाषा हिंदी एवं उसके संवैधानिक महत्व पर शोध, सारांश एवं डिजिटल प्रस्तुति (Presentation) तैयार करना। • AI Grammar एवं Writing Tools का उपयोग करके वर्णमाला, शब्द-भेद, वाक्य-रचना, कारक, विराम-चिह्न तथा वर्तनी शुद्धता का अभ्यास करना एवं त्रुटियों का विश्लेषण करना। • AI की सहायता से हिंदी व्याकरण पर आधारित प्रश्नसंच (Question Bank), Quiz तथा Interactive अभ्यास-पत्र तैयार करना। • AI Writing Tools का उपयोग करके सामाजिक, आत्मकथात्मक एवं समसामयिक विषयों पर निबंध लेखन करना तथा AI द्वारा तैयार निबंध और विद्यार्थी द्वारा लिखे गए निबंध का तुलनात्मक विश्लेषण करना। • AI की सहायता से कठिन शब्दों के अर्थ, पर्यायवाची, विलोम, शब्दावली तथा सरल भाषा में व्याख्या तैयार करना। • AI Voice Tools का उपयोग करके शुद्ध उच्चारण, वाचन एवं मौखिक अभिव्यक्ति का अभ्यास करना तथा उच्चारण संबंधी Feedback प्राप्त करना।	20
कुल अंक	**20**

11.	**संदर्भ ग्रंथ सूची –** 1. बाबूराम सक्सेना – सामान्य भाषा विज्ञान, हिंदी साहित्य सम्मेलन, प्रयाग। 2. कामताप्रसाद गुरू – हिंदी व्याकरण, लोकभारती प्रकाशन, इलाहाबाद। 3. आचार्य देवेंद्र नाथ शर्मा – भाषा विज्ञान की भूमिका, राधाकृष्ण प्रकाशन, दिल्ली। 4. भाषा विज्ञान एवं भाषा शास्त्र – कपिलदेव द्विवेदी, विश्वविद्यालय प्रकाशन, वाराणसी। 5. भोलानाथ तिवारी, भाषा विज्ञान, किताब महल, इलाहाबाद।

Bos in Hindi :

Sr No	Name of the Faculty	Designation and College
1.	Dr. Bhavna M.Rochlani	I/C HOD Asst. Professor CHM College Ulhasnagar
2.	Dr. Ajeet Kumar Rai	Associate Professor KC College Mumbai
3.	Dr. Santosh Motwani	Associate Professor RKT College Ulhasnagar

Name & Signature of the Ad-hoc BoS Chairperson –

Dr. Bhavna M. Rochlani : _____

Name & Signature of the Dean –

Dr. Nitin Arekar : _____

Hiranandani Mansukhani College, Ulhasnagar * Smt Chandibai (Autonomous)

27

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

First Year

Semester- IV

Title: Cocurricular Course I

Vertical - 6
Cocurricular Course - 2 Credits

with effect from
Academic Year 2025-2026

Title: Cocurricular Course - I

Course Code: CHMCCI6

Sr. No.	Heading	Particulars
1	**Description the Course:**	This student-friendly Co-Curricular Course is uniquely designed to promote holistic development through active participation in various college-based activities. Unlike traditional theory-based subjects, this course emphasizes hands-on involvement and experiential learning. Students are encouraged to explore their interests and talents by engaging in cultural, social, literary, sports, extension, or club-based events conducted by the college throughout the academic year. Participation will be recorded and assessed based on involvement, initiative, team spirit, creativity, and consistency. The aim is to nurture essential life skills such as leadership, communication, collaboration, and responsibility in a supportive, informal setting. This non-theory course offers students the opportunities and the freedom to learn beyond the classroom and grow into well-rounded individuals, contributing positively to campus life and society.
2	**Vertical 6**	Cocurricular Course (Mandatory)
3	**Type** **Teaching Methods**	Non Theory Participation, Report Writing, Presentation etc.
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives**: 1. To inculcate a spirit of active participation in cultural, social, environmental, and creative activities. 2. To enhance personal and interpersonal skills through real-life experiences and teamwork. 3. To foster a sense of responsibility, leadership, and community engagement among students. 4. To develop self-confidence and emotional well-being through creative expression and collaboration. 5. To integrate classroom learning with experiential learning for holistic growth.	
8	**Learning Outcomes**: By the end of the course, students will be able to: **LO1:** Participate meaningfully in diverse co-curricular activities and reflect on their learning experiences. **LO2:** Demonstrate improved communication, leadership, and teamwork skills. **LO3:** Exhibit increased awareness of social responsibility and civic engagement. **LO4:** Build confidence through creative, cultural, and intellectual expressions. **LO5:** Maintain a portfolio or activity log to track participation and personal development.	

9	**Syllabus** **Unit I - Suggested Areas of Participation in the activities:** • **Cultural Events:** Drama, dance, music, literary events, debates, etc. • **Social Outreach:** Blood donation, awareness campaigns, cleanliness drives. • **Clubs & Societies:** Photography, quiz, environment club, shram club, etc. • **Sports & Fitness:** College tournaments, yoga, marathons, fitness challenges. • **Institutional Events:** Foundation Day, Annual Day, College Festivals, Intercollegiate events. • **National Festivals:** Independence Day, Republic Day etc. **Unit II - Program Specific Topics** • **Workshops/Seminars:** Report Writing, Personality Development, Soft Skills, Leadership Talks. • **Speak, Show, Shine:** Presentation / Poster Presentation / Viva and Learning Experience **Mode of Evaluation:** • **Faculty Coordinator:** To guide and evaluate student progress. • **Participation Proof:** Certificates, photos, attendance records. • **Reflective Journal:** Minimum 2–3 pages summarizing experiences, learning, and growth. • **Final Viva/Presentation:** 5-minute talk on poster presentation and on overall learning.
10	**Scheme of Examination and Assessment Pattern** **Based on 3 approved Activities** **Semester End External - 30 marks**

Activity No	Nature of Activities	Marks
1.	Title of Approved Activity - 1	10
2.	Title of Approved Activity - 2	10
3.	Title of Approved Activity - 3	10
	Total	**30**

Internal Examination: Continuous Evaluation – 20 marks

	Assessment / Evaluation	Marks
1.	Reflective journal	10
2.	Presentation/ poster presentation/viva	10
	Total	**20**

Suggested Readings:

- How to Win Friends and Influence People
- The 7 Habits of Highly Effective People
- Thinking, Fast and Slow
- Leaders Eat Last
- Talk Like Ted

Name & Signature of the Principal & Chairperson, Academic Council:

Dr. Manju Lalwani Pathak

Smt. Chandibai Himathmal Mansukhani College
(Autonomous)

Second Year B. Com.

Semester- III

Title: Field project

Vertical - 6
Field Project 2 Credits

with effect from
Academic Year 2025-2026

Title: Field Project

Course code:

Sr. No.	Heading	Particulars
1	**Description the Course:**	The Field Project course, introduced under CHM Autonomy in alignment with the NEP 2020, aims to bridge theoretical knowledge with practical experience. It provides students with hands-on exposure to real-world socio-economic contexts through field visits, observation, and analysis in both urban and rural settings. By engaging directly with development-related issues, students enhance their research, problem-solving, and analytical skills while fostering social responsibility and environmental awareness. The course ultimately prepares learners for employability and active participation in nation-building.
2	**Vertical 6**	Field Project
3	**Type & Teaching Methods**	Field work
4	**Credit**	2 Credits
5	**Hours allotted**	30 Hours
6	**Marks allotted**	50 Marks
7	**Course Objectives:** 1. To connect theoretical learning with real-world socio-economic contexts through practical field experiences. 2. To develop analytical, problem-solving, and teamwork skills in addressing contemporary social issues. 3. To cultivate an appreciation for research and its role in promoting societal and national development.	
8	**Learning Outcomes:** **students will be able to:** **LO1**: Apply classroom knowledge to analyze real-life socio-economic challenges effectively. **LO2**: Demonstrate critical thinking, teamwork, and decision-making skills through field-based activities. **LO3**: Reflect on the relevance of research and experiential learning in contributing to social and national progress.	

9

Guidelines for Field Project

Following are the general guidelines for the conduct of Field Project (Semester III & IV)

Head of the Department (HOD)/ Field Project Co-ordinator

1. To ensure that FP program aligns with departmental and academic objectives as per NEP Structure within syllabus framework.
2. Appointment of field project incharges from the faculty of the department for group of Students.
3. To conduct orientation of FP Supervisor and decide the time line of the project.
4. To support the student for Filed Project.

FP Supervisor:

1. To give Guidelines for the field project.
2. To monitor student progress and provide guidance.

Project (Dissertation) Report:

Students are required to submit a report of the field project at the end of the semester in following suggested format.

The project should be typed on A4 sheets Font Size 12, Times New Roman, 1.5 line Spacing The project report shall have student details with signature of Field Project Incharge and photographs if any and it should be of minimum of 10 pages.

10

Scheme of Examination and Assessment Pattern

External Examination: Semester End External - 30 marks

Format of Question Paper

Nature of Evaluation	Marks
Field Project Report	30
	Total 30

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	Marks
1.	Involvement in Survey of Field Project /	05
2.	Field visit participation & completion	10
3.	Overall Impression	05
		Total 20

11	**Appendix I** **Attendance of the Student: Active Participation** I, the undersigned Ms / Mr._____ Roll No. ___ studying in the _____ Year of _____Full-time Course is doing my project work under the guidance of Dr./Ms./Mr. _____ _____ __, I wish to state that I have met my Internal guide on the following dates mentioned below for Project Guidance: - Sr.No. Date Signature of the Internal Guide _____ _____ _____ **Signature of the Candidate** **Signature of Field Project Supervisor**
	Appendix II **Name of the Department/College/Institute** **Certificate** I hereby certify that Mr./Ms. _____ Student of _____ studying in _____, has completed a project titled _____ _____ in the area of _____ specialization for the academic year 2025-2026 to the best of my knowledge the work of the student is original and the information included in the project is correct. _____ _____ **Field Project Supervisor** **Head of the Department/Principal**

Board of Examination

Principal & Chief Controller
Board of Examination

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College

(Autonomous)

Affiliated to the University of Mumbai

Third Year B.Sc. (Botany)

Semester- V

Paper-I

Title: Plant Diversity

2 Credits

With the effect of
Academic Year 2026-2027

Title: Plant Diversity

(Course Code: CHMBOTV1)

Sr. No.	Heading	Particulars
1	Description of the Course:	This course on Plant Diversity provides an in-depth understanding of the vast diversity, structure, life cycles, and systematic position of major plant groups ranging from algae, fungi, lichens, bryophytes, pteridophytes, and gymnosperms to angiosperms along with the study of general symptoms of plant diseases. It also provides detailed knowledge of important angiosperm families based on Bentham and Hooker's classification system, including their distinguishing characters, floral features, systematic position, and economic importance. The course aims to develop an understanding of plant diversity, evolutionary relationships, and principles of plant classification and systematics.
2	Vertical	1
3	Type & Teaching Methods	Theory, Inquiry-based learning
4	Credit:	2 Credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: **CO(A)1:** To provide knowledge of the structure, life cycles, and systematic position of representative members of algae, fungi, bryophytes, pteridophytes, and gymnosperms. **CO(A)2:** To develop an understanding of the diversity, evolutionary relationships, and distinguishing characteristics of major plant groups. **CO(A)3:** To familiarize students with the principles of plant taxonomy and classification, particularly Bentham and Hooker's system of angiosperm classification. **CO(A)4:** To impart knowledge about economically important plant families, lichens, and general symptoms of plant diseases with reference to their ecological and applied significance.	

8	**Course Outcomes**: Students should be able to: **CO1:** Describe the structure, life cycles, and systematic position of representative members of algae, fungi, bryophytes, pteridophytes, and gymnosperms. **CO2:** Differentiate major plant groups based on their morphological, reproductive, and evolutionary characteristics. **CO3:** Identify important angiosperm families using diagnostic characters, floral formulae, floral diagrams, and their economic importance. **CO4:** Explain the principles, merits, and limitations of Bentham and Hooker's classification system and recognize common symptoms of plant diseases.
9	**Syllabus** **UNIT I: Algae, Fungi, Bryophyta and Plant Pathology 15 L** • Algae- Systematic position and life cycle (excluding development stages of sex organs) of *Polysiphonia.* • Fungi- Systematic position and life cycle (excluding development stages of sex organs) of *Puccinia* • Study of Lichens • Bryophyta- Systematic position and life cycle (excluding development stages of sex organs) of *Marchantia.* • Plant Pathology- General symptoms of Plant Diseases **UNIT–II: Pteridophyta, Gymnosperms, Palaeobotany and Angiosperms 15 L** 1. **Pteridophyta-** Systematic position and life cycle (excluding development stages of sex organs) of *Marselia.* *2.* **Gymnosperms-** Systematic position and life cycle (excluding development stages of sex organs) of *Gnetum.* 3. **Paleobotany:** *Rhynia, Codaites* 4. **Angiosperms-**Study of following families according to Bentham and Hooker's System with reference to systematic position, distinguishing characters, economic importance, general floral formula, floral diagram of following families: Magnoliaceae, Leguminoceae: (Mimosae, Ceasalpineae, Papilionaceae), Apocynaceae, Amaryllidaceae

- Bentham and Hooker's classification system of Angiosperms – outline, merits and Demerits

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

Examination: Semester End External - 30 marks Time: 2:00 hours

Format of Question Paper

Note:

1. Attempt all questions.
2. All questions carry equal marks

Sr. No.	Evaluation type	Marks	Unit
Q.1.	Multiple choice Questions/ Fill in the blanks a**ny five** out of ten. (5 from each unit)	5	1&2
Q2.	Answer in one -two sentences a**ny five** out of ten. (5 from each unit)	5	1&2
Q3.	Answer **any one** of the following (out of two)	10	1
Q4.	Answer **any one** of the following (out of two)	10	2
		Total 30	

Note

1. **Equal weightage is to be given to all the Units.**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	**Marks**
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
2.	Attendance/*Viva Voce*	5
		Total 20

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Reference books:

- Textbook of Algae (1986) by O. P. Sharma. Tata McGraw Hill.
- Textbook of Botany-Algae (1994) By B. P. Pandey. S. Chand
- Textbook of Botany 3rd Edition (2004) Prof. V. Singh, DR. P.C. Pandey & Dr. D.K Jain. Rastogi Publication

	● Plant Pathology (1982) Dr. B. P. Pandey. S. Chand & Company LTD. ● Botany for Degree Students (1960) By B.R. Vashishta, Dr. A.K. Sinha and Dr. V. P. Singh revised edition 2010 (Reprint 2012), S. Chand & Company LTD. ● Textbook of Fungi (1989) by O.P. Sharma, Tata Mc. Graw ● Textbook of Algae (1986) by O.P. Sharma. Tata McGraw Hill ● Textbook of Botany 3rd Edition (2004) Prof. V. Singh, DR. P.C. Pandey & Dr. D.K Jain. Rastogi Publication ● Sharma, O.P. (2009). Plant Taxonomy (2nd Edition). McGraw Hill Education (India) Pvt. Ltd., New Delhi.

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College

(Autonomous)

Affiliated to the University of Mumbai

Third Year B.Sc. (Botany)

Semester- V

Practical-I

Title: Practicals in Plant Diversity

2 Credits

With effect from
Academic Year 2026-2027

Title: Practicals in Plant Diversity

(Code: CHMBOTV2)

Sr. No.	Heading	Particulars
1	Description of the Course:	This practical course provides training in the study and identification of major plant groups from algae to angiosperms using fresh, preserved specimens and permanent slides. It covers morphology, life cycles, and diagnostic features of representative genera along with basic plant pathology and angiosperm taxonomy based on Bentham and Hooker's system. The course also develops essential skills in microscopic observation, specimen identification, and botanical classification.
2	Vertical	1
3	Type & Teaching Methods	Practicum
4	Credit:	2 Credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: **CO(A)1:** To develop hands-on skills in the observation and identification of life cycle stages of major plant groups including algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms. **CO(A)1:** To train students in the study of plant diseases and fungal diversity through observation of symptoms, slides, and natural specimens. **CO(A)1:** To familiarize students with plant taxonomy techniques such as herbarium preparation, use of floras, and construction of dichotomous keys for plant identification.	

	CO(A)1: To enhance applied understanding of plant diversity and microbiology through field visits, laboratory exercises, and small projects such as digital herbarium and microbial studies.
8	**Course Outcomes**: After completion of course, students should able to: **CO1: i**dentify and describe different stages in the life cycles of algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms using fresh, preserved, and slide materials. **CO2:** recognize and interpret common plant diseases and fungal structures and explain their symptoms and significance in plant pathology. fungi and bacteria. **CO3: a**pply basic taxonomic tools such as floras, dichotomous keys, and herbarium techniques for accurate plant identification and classification. **CO4:** demonstrate practical skills in biodiversity documentation and applied studies through field work, small projects, microbial isolation, and digital herbarium preparation.
9	**Syllabus** **Practical External:** 1. Study of stages in the life cycle of *Pinnularia* and *Polysiphonia* from fresh/preserved material and permanent slides. 2. Study of stages in the life cycle of *Puccinia, Agaricus, Fusarium* from fresh/preserved material and permanent slides. 3. Plant Pathology: Citrus canker, Tikka disease, Smut disease. 4. Study of stages in the life cycle of *Marchantia* and *Funaria* from fresh/preserved material and permanent slides. 5. Study of stages in the life cycle of *Lycopodium* and *Marselia* from fresh/preserved material and permanent slides 6. Study of stages in the life cycle of *Ephedra* and *Gnetum* from fresh/preserved material and permanent slides. 7. Study of one plant from each of the following Angiosperm families as per Bentham and Hookers classification System. Magnoliaceae, Leguminoceae (Mimosae, Ceasalpineae, Papilionaceae), Apocynaceae and Amaryllidaceae 8. Identify the genus and species with the help of flora. 9. Study of Pteridophyte Fossil- *Rhynia* (Identification)

Practical Internal:

1. Algal Culturing: isolation and cultivation of microalgae using suitable growth media. [Demonstration only].
2. Isolation of fungi from the various substrates (soil/water/fruits/vegetables).
3. Analysis of total viable count from market product (Biofertilizer/Bioinsecticide).
4. Slide preparation and photography of any five monocot and dicot stem from the campus or nearby areas for comparative study.
5. Field Visit/Industrial visit.
6. Preparation of Taxonomic keys – Dichotomous keys

Submission

1. Plant fungal diseases (5 symptoms).
2. Herbarium sheets of plants from the above families
   Listing the flora of the campus

10

Scheme of Examination and Assessment Pattern

Practical Paper – 50 Marks

Semester End Practical exam - 50 marks Time: 3:00 hours

Format of Question Paper

Question No	Questions	Marks
Q.1.	Identify, Classify and Comment on Specimen 'A.' and 'B'. Sketch neat and labelled diagram.	10
Q.2.	Make a temporary stained preparation T.S. of specimen 'C'. Comment on it.	05
Q.3.	Classify the given specimen 'D' upto family giving reasons. Sketch floral formula/floral diagram.	06
Q.5.	Identify and comment on given Specimen/ Slide/ photograph 'E' and 'F'	06
Q.6.	Journal	03

Total 30

Key:
A&B: Algae/Fungi/Bryophytes
C: Pteridophytes/ Gymnosperm
D- Angiosperms- Families
E, F- Plant disease/Fossil

Note

1. 75% attendance in practical is compulsory
2. Practical journal is must for practical examination
3. Journal should be certified by Head of Department

Sr. No	**Internal Examination: Continuous Evaluation - 20 marks**	**Marks**

	1.	Students should isolate fungi from the various substrates (soil/water/fruits/vegetables). **OR** Analysis of total viable count from market product (Bio fertilizer/Bio insecticide).	10
	2.	Students should submit Dichotomous keys of families from syllabus. **OR** Plant fungal diseases (5 symptoms).	10
		Total	**20**
11	**Reference books:** 1. B. P. Pandey College Botany, Vol. I. 2022, S. Chand Publishing 2. B. P. Pandey College Botany, Vol. II. 2022, S. Chand Publishing 3. V. Singh, P. C. Pandey and D. K. Jain: A Textbook of Botany, 2014, 5th Ed. Rastogi Publications 4. C. J. Alexopoulos, C. W. Mims and M. Blackwell. 1996. Introductory Mycology. 4th Edition, John Wiley & Sons 5. A. Rashid. 1999. An Introduction to Pteridophyta. 2nd Ed. Vikas Publishing House Pvt. Ltd. 6. S. P. Bhatnagar and A. Moitra. 1996. Gymnosperms. New Age International Publishers 7. B. Pandey. 2007. Taxonomy of Angiosperms, S. Chand Publishing 8. Gurcharan Singh, 2019. Plant Systematics: Theory and Practice, 4th Ed. Oxford & IBH Publishing		

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College

(Autonomous)

Affiliated to the University of Mumbai

Third Year B.Sc. (Botany)

Paper-II

Semester- V

Title: Plant Physiology and Biochemistry

2 Credits

with effect from
the Academic Year 2026-2027

Title: Plant Physiology and Biochemistry
Course Code: CHMBOTVI3

Sr. No.	Heading	Particulars
1	Description of the Course:	The course Plant Physiology and Biochemistry is designed to develop conceptual understanding and analytical competence in core physiological and biochemical processes of plants. The course enables learners to remember and explain fundamental principles of plant–water relations, solute transport, and photosynthesis. Students will analyse and differentiate various pathways of carbon fixation, respiration, and nitrogen metabolism to understand their functional significance in plant growth and productivity. Through systematic study of metabolic pathways, learners will apply biochemical concepts to interpret cellular respiration, lipid metabolism, and enzymatic processes in plants. The course further encourages students to illustrate and evaluate physiological and biochemical pathways, fostering scientific reasoning and problem-solving skills relevant to higher education, research, and applied plant sciences.
2	Vertical	1
3	Type & Teaching Methods	Theory, Inquiry-based learning
4	Credit:	2 Credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: **CO(A)1:** explain the fundamental principles of water movement in plants. **CO(A)2:** compare and contrast the pathways of carbon fixation and photorespiration. **CO(A)3:** summarize the concepts in cellular respiration, nitrogen metabolism and classification of lipids. **CO(A)4:** describe the process of cellular respiration, nitrogen metabolism and fatty acid biosynthesis.	

8	**Course Outcomes**: After completion of course, students will able to: **CO1:** explain plant–water relations and transport mechanisms for water and solutes. **CO2**: analyze the various pathways of carbon fixation and photorespiration. **CO3**: understand the concepts in cellular respiration, nitrogen metabolism and classification of lipids. **CO4**: illustrate pathways of cellular respiration, nitrogen metabolism and lipid metabolism.
9	**Syllabus** **UNIT-1: Plant Physiology** **Plant-water relations:** 1. Importance of water, water potential and its components, osmosis, diffusion and imbibition. 2. Mechanism of Ascent of sap - Root pressure theory. 3. Transport of solutes - Mechanism of transport- passive or downhill transport- Simple diffusion, Ion channels, carrier/ facilitated diffusion. Active transport or uphill transport- Sodium-Potassium pump cycle- electroneutral, electrogenic. **Translocation of solutes:** 1. Ringing experiment 2. Composition of phloem sap 3. Anatomy of sieve elements 4. Phloem loading and unloading **5.** Mechanism of sieve tube translocation - Pressure flow hypothesis. **Module 2: Biochemistry** **Enzymes:** **1.** Introduction and classification of enzymes **2.** Mechanism of enzyme action **3.** Enzyme kinetics: Michaelis–Menten equation, Km, Vmax **4.** Factors affecting enzyme activity **Respiration in Plants** **5.** Glycolysis – steps and significance **6.** Krebs cycle (TCA cycle) – steps and significance **7.** Electron Transport System (ETS) and ATP synthesis **8.** Bioenergetics and role of ATP **Nitrogen metabolism** 1. Nitrogen cycle, methods of nitrogen fixation. 2. Root nodule formation and Leghaemoglobin.

3. Mechanism of nitrogen fixation- Nitrogenase activity, Nitrate and Nitrite reductase activity
4. Assimilation of ammonia/ Amino acid synthesis.

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

Examination: Semester End External - 30 marks Time: 2:00 hours

Format of Question Paper

Note:

1. Attempt all questions.
2. Draw neat and labelled diagrams wherever necessary.

Sr. No.	Evaluation type	Marks	Module
Q.1.	Multiple Choice Question /Fill in the Blanks (Any 5 out of 10) (5 from each Module)	5	1 & 2
Q.2.	Answer in 1-2 Sentences: (Any 5 out of 10) (5 from each Module)	5	1 & 2
Q.3.	Answer any 1 of the following. (Any 1 out of 2)	10	1
Q.4.	Answer any 1 of the following. (Any 1 out of 2)	10	2
		Total 30	

Note

1. **Equal weightage is to be given to all the Units.**
2. **Individual Passing in Internal and External Examination.**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	**Marks**
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
2.	Attendance/*Viva Voce*	5
		Total 20

11

Reference books:

1. Plant Physiology, Datta, S.C. (2007), New Age International (P) Ltd., Publishers, New Delhi.
2. Plant Physiology, Hans Mohr & P. Schopfer (2006), Springer (India) Pvt. Ltd., New Delhi.
3. Plant Biochemistry, Hans-Walter heldt (2005), Academic Press, U.S.A.
4. Introduction to Plant Physiology, Hopkins, W.G. & N.P.A. Huner (2014), Wiley India Pvt. Ltd., New Delhi.

	5. Introductory Plant Physiology, Noggle Ray & J. Fritz (2013), Prentice Hall (India), New Delhi. 6. Plant Physiology, Pandey, S.M. &B.K. Sinha (2006), Vikas Publishing House, New Delhi. 7. Plant Physiology, Salisbury, Frank B. & Cleon W. Ross (2007), Thomsen & Wadsworth, Australia &U.S.A. 8. Modern Plant Physiology, Sinha, R.K. (2014), Narosa Publishing House, New Delhi. 9. Plant Physiology, Taiz, L.&E. Zeiger (2003), Panima Publishers, New Delhi. 10. Text Book of Plant Physiology, Verma, V. (2007), Ane Books India, New Delhi 11. Lehninger Principles of Biochemistry – David L. Nelson & Michael M. Cox 12. Harper's Illustrated Biochemistry- Victor W. Rodwell et al. 13. Fundamentals of Biochemistry: Life at the Molecular Level – Voet, Voet, and Pratt 14. Biochemistry – Mathews, Van Holde, and Ahern 15. College Botany, Volume-III, Pandey, B.P. (2013), S. Chand Publishing, New Delhi. 16. A Text Book of Botany, Volume III, Ghosh, A. K., K. Bhattacharya & G. Hait (2011), New Central Book Agency Pvt. Ltd., Kolkata.

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College

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Third Year B.Sc. (Botany)

Practical-II

Semester- V

Title: Practicals in Plant Physiology, Biochemistry, Biostatistics and Bioinformatics

2 Credits

with effect from
the Academic Year 2026-2027

Title: Practicals in Plant Physiology, Biochemistry, Biostatistics and Bioinformatics
Course Code: CHMBOTVI4

Sr. No.	Heading	Particulars
1	Description of the Course:	This course provides practical and theoretical training in key biochemical, physiological, statistical, and bioinformatics techniques used in plant and life sciences. Students develop laboratory skills in biochemical analysis, plant nutrition, enzyme studies, and data analysis while gaining hands-on experience with bioinformatics tools. The course prepares learners for careers in biotechnology, research, pharmaceutical, agricultural, and environmental laboratories, and supports entrepreneurial opportunities in diagnostic, tissue culture, and biotechnology-based enterprises
2	Vertical	1
3	Type & Teaching Methods	Practicum
4	Credit:	2 Credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: **CO(A)1:** To understand the concept of enzyme kinetics through experimentation. **CO(A)2**: To estimation of alpha amino nitrogen and proteins using standard protocols. **CO(A)3**: To apply statistical tools for analysis of experimental data using Analysis of variance under Randomized Block Design **CO(A)4**: gain practical exposure to bioinformatics tools for sequence similarity search and protein structure visualization	
8	**Course Outcomes**: After completion of course, students will able to: **CO1**: evaluate the effect of pH, substrate concentration on enzyme activity using amylase as a model enzyme. **CO2**: calculate and interpret alpha amino nitrogen and proteins from plant samples **CO3**: perform and apply ANOVA under Randomized Block Design by computing and interpreting ANOVA tables to test significance of experimental results **CO4**: execute BLASTN and BLASTP searches and retrieve, visualize, and interpret protein structures using RasMol	

9

Syllabus

Practical External:

1. Estimation of alpha amino nitrogen.
2. Estimation of reducing sugars by DNSA method.
3. Estimation of proteins by Lowry's method.
4. Determination of the saponification value of given oil sample
5. Thin layer chromatography for separation of carotenoids/lycopene.
6. Assay of amylase activity (pH, temperature).
7. Problems on Randomized Block Design (RBD)
8. Similarity Sequence Search Using BLASTN & BLASTP

Practical Internal:

1. Determination of osmotic potential of plant cell sap by plasmolytic method using locally available plants. (Photos and report for submission Internal Examination)
2. Study of anatomical features of C3 and C4 plants using locally available plants. (Photos and report for submission Internal Examination).
3. Problems on Latin Square Design (LSD).
4. Protein Structure Retrieval and Visualization Using RasMol.

10

Scheme of Examination and Assessment Pattern

Practical Paper – 50 Marks

Semester End Practical exam - 50 marks Time: 3:00 hours

Format of Question Paper

Question No	Questions	Marks
Q.1.	Perform the physiological experiment 'A'.	10
Q.2.	Perform biostatistics experiments 'B'.	08
Q.3.	Perform Bioinformatics experiment 'C'	05
Q.4.	Viva	03
Q.5.	Journal	04
		Total 30

Keys

A– Effect of pH concentration on the activity of enzyme amylase/ Estimation of alpha amino nitrogen/ Estimation of proteins

B– Problems on Randomized Block Design (RBD)

C– Similarity Sequence Search Using BLASTN & BLASTP

Keys

A– Effect of pH concentration on the activity of enzyme amylase/ Estimation of alpha amino nitrogen/ Estimation of proteins

B– Problems on Randomized Block Design (RBD)

C– Similarity Sequence Search Using BLASTN & BLASTP

Note

1. 75% attendance in practical is compulsory
2. Practical journal is must for practical examination
3. Journal should be certified by Head of Department

	Internal Examination: Continuous Evaluation - 20 marks	
1.	Photos and Report Submission of Internal Practical 1 and Practical 2	4+4
2.	Problems on Latin Square Design (LSD). (2 Problems)	07
3.	Protein Structure Retrieval and Visualization Using RasMol. (Perform and interpret)	05
	Total	**20**

11 **Reference books:**

1. Sivakumar, R (2015). Practical Plant Physiology. Narendra Publishing House.
2. Kuruwanshu and Guhey (2016). Practical manual on principles of plant physiology. Indira Gandhi Krishi Viswavidyalay, Raipur.
3. Anupama Verma, Ravindra Sachan (2025). Practical Manual on Plant Physiology. S.K. Kataria & Sons
4. Tiwari, Dr. Gyanendra (2010). Practical Manual of Plant Physiology. RVSKVV, GWALIOR (M.P.)
5. Bala M. Practical In Plant Physiology And Biochemistry. Scientific Publishers.
6. Hopkins, W.G. & N.P.A. Huner (2014). Introduction to Plant Physiology, Wiley India Pvt. Ltd., New Delhi.
7. Noggle Ray & J. Fritz (2013). Introductory Plant Physiology, Prentice Hall (India), New Delhi.
8. Pandey, S.M. &B.K. Sinha (2006). Plant Physiology, Vikas Publishing House, New Delhi.
9. Salisbury, Frank B. & Cleon W. Ross (2007). Plant Physiology, Thomsen & Wadsworth, Australia &U.S.A.
10. Taiz, L.&E. Zeiger (2003). Plant Physiology, Panima Publishers, New Delhi.
11. Verma, V. (2007). Text Book of Plant Physiology, Ane Books India, New Delhi.

HSNC Board's

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Third Year B.Sc. (Botany)

Semester- V

Paper-III

Title: Indian Knowledge System

2 Credits

Course Code: CHMBOTV5

With effect from
Academic Year 2026-2027

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College

(Autonomous)

Third Year B.Sc. (Botany)

Elective Paper

Semester- V

Title: Horticulture

4 (T-2+P-2) Credits

with effect from
Academic Year 2026-2027

Title: Horticulture

(Course Code: CHMBOTV6)

Sr. No.	Heading	Particulars
1	Description of the Course:	This course provides comprehensive knowledge of the principles and practices of horticulture with special emphasis on sustainable horticultural production systems. The course introduces students to the scope and significance of horticulture, major branches, and important national horticultural research institutes. It covers conventional and modern propagation techniques including seed propagation, vegetative propagation, micropropagation, and synthetic seed technology. The course further explores advanced horticultural production systems such as protected cultivation, hydroponics, aeroponics, aquaponics, and vertical farming. Commercial cultivation practices of selected high-value horticultural crops including exotic vegetables, floricultural crops, medicinal plants, and mushrooms are discussed. Additionally, the course familiarizes students with emerging technologies in horticulture, particularly Artificial Intelligence (AI), precision farming, drone applications, and AI-based crop monitoring and disease diagnosis for sustainable and efficient crop management.
2	Vertical	1
3	Type & Teaching Methods	Theory, Inquiry-based learning
4	Credit:	2 Credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives:** **CO(A)1:** To understand the scope, importance, and branches of horticulture and the role of major horticultural institutes. **CO(A)2:** To study conventional and modern methods of plant propagation used in horticultural crops. **CO(A)3:** To acquaint students with protected cultivation and soilless farming technologies.	

	CO(A)4: To develop knowledge of commercial production practices of selected horticultural enterprises. **CO(A)5:** To introduce students to Artificial Intelligence and other hi-tech tools used in modern horticulture.
8	**Course Outcomes (COs):** After completing the course, students will be able to: **CO1.** explain the fundamental concepts, branches, and significance of horticulture. **CO2.** demonstrate knowledge of seed, vegetative, and advanced propagation techniques. **CO3.** describe protected cultivation systems and modern soilless farming methods. **CO4.** evaluate cultivation practices of commercially important horticultural crops and mushrooms. **CO5.** apply AI-based technologies and precision farming concepts for efficient crop management.
9	**Syllabus** **UNIT- 1: Fundamentals and Sustainable Horticulture** **Introduction to Horticulture**: **1.** Definition, scope, and importance of horticulture **2.** Branches of horticulture: Pomology, Olericulture, Floriculture, and Landscape gardening; **3.** Horticulture Institutes: ICAR-Indian Institute of Horticultural Research (IIHR), ICAR-National Research Centre for Grapes and ICAR-National Research Centre for Banana **Propagation Techniques:** **4.** Seed Propagation: Concept, Seed viability tests, Seed Dormancy, Methods to overcome seed dormancy, Treatment of seeds to promote germination, Methods of seedling, advantages and limitations **5.** Vegetative Propagation: Advantages and limitations • Propagation by apomictic seedlings • Propagation by specialized vegetative structures bulbs, tubers, Corm, rhizome, runner, offset, stolon • Propagation by cutting, layering, grafting, budding,

Modern techniques in Horticulture:

6. Micropropagation: Advantages and limitations, Stages of Micropropagation, Commercial Applications
7. Synthetic Seeds: Introduction, Advantages and limitations, Methods for production of synthetic seeds

UNIT- 2: Applied and Advanced Horticulture

Protected Cultivation Technologies:

1. Greenhouses and Polyhouse Cultivation
2. Hydroponics, Aeroponics, Aquaponics and Vertical forming

Commercial Horticulture: High-Value Crop Production.

3. Exotic vegetables- Broccoli
4. Floriculture- Gerbera
5. Medicinal and aromatic plant- *Aloe vera* and Satavari
6. Mushroom- *Pleurotus* and *Agaricus*

Artificial Intelligence in Crop management (Hi-Tech horticulture):

7. Precision Farming, Use of Drones**.**
8. AI Based crop monitoring-Image based crop monitoring, Detection of plant growth stages, Real time field surveillance
9. Disease and Pest diagnosis-AI-assisted identification of disease from leaf, stem images, Mobile application for disease diagnosis

10

Scheme of Examination and Assessment Pattern
Paper – 50 Marks
Examination: Semester End External - 30 marks Time: 2:00 hours
Format of Question Paper

Note:

1. Attempt all questions.
2. All questions carry equal marks

Sr. No.	Evaluation type	Marks	Unit
Q.1.	Multiple Choice Question /Fill in the Blanks (Any 5 out of 10) (5 from each unit)	5	1 & 2
Q.2.	Answer in 1-2 Sentences: (Any 5 out of 10) (5 from each unit)	5	1 & 2
Q.3.	Answer any 1 of the following. (Any 1 out of 2)	10	1
Q.4.	Answer any 1 of the following. (Any 1 out of 2)	10	2

	Total 30	

Note

1. **Equal weightage is to be given to all the Units.**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	**Marks**
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
2.	Attendance/*Viva Voce*	5
		Total 20

11 **Reference books**:

- Bhattacharjee, S. K. (2012). Landscape gardening and design with plants. Aavishkar Publishers, Distributors.
- Blum, J. (Ed.). (2021). Urban horticulture: Ecology, landscape, and agriculture. Apple Academic Press.
- Buckley, R. (2009). Ecotourism: Principles and practices. CABI.
- Jitendra Singh. (2020). Fundamentals of horticulture (2nd ed.). Kalyani Publishers.
- Kumar, N. (2020). Introduction to Horticulture. Oxford and Ibh Publishers.
- Laxmi Joshi. (2025). Horticulture; A Complete Introduction. Educohack Press.
- Parvatha Reddy, P. (2011). Hand book of biological control in horticultural crops. Studium Press.
- Peter, K. V. (2009). Basics of horticulture. New India Pub. Agency.
- Rajendra Singh Rathore, Praveen K Singh, Rajiv K Narolia, & Raksha Pal Singh. (2021). Hi-Tech Horticulture: Approaches for Cultivation and Value Addition: Vol. I (I). Sr edu publications.
- Sharma, R. R. (2016). Propagation of horticultural crops: Principles and practices. Kalyani Publishers.
- Singh, R. (2021). Textbook on Horticulture (1st ed). New India Publishing Agency.

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College

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Third Year B.Sc. (Botany)

Semester- V

Elective Practical

Title: Practicals in Horticulture

2 Credits

With effect from
Academic Year 2026-2027

Title: Practicals in Horticulture

Course Code: CHMBOTV7

Sr. No.	Heading	Particulars
1	Description of the Course:	This practical course provides hands-on training in various horticultural techniques and modern production systems. Students gain practical exposure to garden tools, plant propagation methods, biofertilizers, fertilizer analysis, estimation of organic matter, garden designing, hydroponics, and disease diagnosis. The course also introduces students to protected cultivation technologies, mushroom spawn production, and the application of Artificial Intelligence tools in horticultural crop management through field visits and experiential learning.
2	Vertical	1
3	Type & Methods	Practicum
4	Credit:	2 Credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: ● To familiarize students with common horticultural tools, potting media, and plant propagation techniques. ● To develop practical skills in the identification of biofertilizers, fertilizer analysis, and estimation of soil organic matter. ● To impart knowledge on garden planning, landscaping components, and protected cultivation structures. ● To provide hands-on training in hydroponics, mushroom spawn production, and management of common horticultural plant diseases.	

	● To introduce students to modern digital technologies, including AI-based applications for crop monitoring and disease diagnosis..
8	**Course Outcomes (COs):** After completion of the course, students will be able to: **CO1.** identify and effectively use horticultural tools, potting media, and various plant propagation methods. **CO2. p**erform basic laboratory and field analyses related to fertilizers and organic matter estimation. **CO3.** design and prepare garden layouts incorporating essential landscape components and protected cultivation systems. **CO4.** diagnose common horticultural plant diseases and demonstrate practical skills in hydroponics and mushroom spawn production. **CO5.** apply AI-based applications and modern technologies for disease detection, farm management, and precision horticulture.
9	**Syllabus** **External Practical** 1. Study of common garden tools and implements. 2. Different types of pots and potting media. 3. Propagation methods (As mentioned in theory paper). 4. Identification of biofertilizers. 5. Study of physical and chemical tests for fertilizers. 6. Estimation of organic matter content. 7. Study of garden components including lawns, hedges, pathways, flowerbeds, water bodies, and preparation of garden layout. 8. Application of AI plant disease detection app **Plantix**, Farm management and analysis app **Cropin.** 9. Horticultural plant diseases: Powdery mildew, Bacterial blight, Root-knot disease 10. Hydroponic cultivation of leafy vegetables. 11. Visit the greenhouse / polyhouse / net-house / cold storage and report submission. **Internal practical** ● Study different types of greenhouses based on shape.

- Study of Greenhouse cooling, heating, and ventilation system.
- Demonstration of the effect of a rooting hormone on stem cuttings.
- Mushroom spawn production

Activity:

- Visit to HTC Talegaon/greenhouse farm of commercial flower, vegetable cultivation.

10

Scheme of Examination and Assessment Pattern
Paper – 50 Marks
External Examination: Semester End Practical - 30 marks Time: 3:00 hours
Format of Question Paper

Duration: 2hrs Max. Marks:30

Q. No.	Experiment	Marks
1.	Major practical	08
2	Minor practical	05
3	Identification	09
4	Viva voce	04
5	Journal	04
Internal Practical Examination: Continuous Evaluation - 20 marks		
1	Preparation of Mushroom spawn	05
2	To compare the efficacy of vermicompost, Fungal compost in reference of seed germination	05
3	Project submission	10

Note:

1. 75% attendance in practical is compulsory
2. Practical journal is must for practical examination
3. Journal should be certified by Head of Department

11	**Reference books:** 1. Bailey, Fran, Zia Allaway, and Christopher Young. 2018. Practical House Plant Book. London: Dorling Kindersley. 2. Hakeem, Khalid Rehman, ed. 2021. The Global Floriculture Industry: Shifting Directions, New Trends, and Future Prospects. First edition. Palm Bay, Florida, USA: Apple Academic Press. 3. Mishra, Vishwanath. 2016. Handbook of Practical Horticulture. Ludhiana: Kalyani Publishers. 4. Practical manual of horticulture. 2018. New Delhi: Biotech Books. 5. Prasad, V. M. and Balaji Vikram. 2018. Practical Manual on Fundamentals of Horticulture and Plant Propagation. New Delhi: Educationist Press. 6. Singh, Jitendra. 2014. Basic Horticulture. 4th edn. Ludhiana: Kalyani Publishers.

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College

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Third Year B.Sc. (Botany)

Semester- V

Title: Plant Biotechnology

Minor Subject: 2 Credits

with effect from
the Academic Year 2026-2027

Title: Plant Biotechnology
Course Code: CHMBOTV8

Sr. No.	Heading	Particulars
1	Description of the Course:	This course introduces the principles and applications of plant tissue culture and industrial plant biotechnology. It covers the preparation of culture media, in vitro propagation techniques, callus and suspension cultures, somatic embryogenesis, synthetic seeds, and micropropagation. The course also explores modern gene transfer methods, protoplast culture, cell immobilization, bioreactor technology, and the industrial production of valuable plant-derived products, including secondary metabolites, molecular farming, and algal biotechnology. Emphasis is placed on both fundamental concepts and their commercial and industrial applications in agriculture and biotechnology
2	Vertical-2	Minor
3	Type & Teaching Methods	Theory, Inquiry-based learning
4	Credit:	2 Credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: **CO(A)1:** Understand the nutritional requirements for in vitro plant growth and the significance of callus in plant tissue culture. **CO(A)2:** Explain the principles of micropropagation and somatic embryogenesis with reference to their industrial applications. **CO(A)3:** Acquire knowledge of various gene transfer techniques used in plant biotechnology. **CO(A)4:** Comprehend the diverse applications of plant biotechnology across different industries.	
8	**Course Outcomes**: After completion of course, students will be able to: **CO1**. Explain MS medium composition and demonstrate callus induction in plant tissue culture. **CO2**.Describe the steps involved in micropropagation and somatic embryogenesis and relate them to their applications. **CO3**.Illustrate and compare different techniques of gene transfer in plants.	

CO4.Elaborate on the applications of plant biotechnology in agriculture, industry, and allied sectors.

9

Syllabus

UNIT1- Plant Tissue Culture

1. Nutrient medium for in vitro growth of plant tissue – concept, types: Basal and defined medium.
2. Murashige and Skoog Culture Media Preparation: Macronutrients, micronutrients, vitamins, PGRs, gelling agents, sterilization.
3. Callus Induction and Suspension Cultures: Techniques, optimization factors.
4. Somatic Embryogenesis & Synthetic Seeds: Direct/indirect pathways, encapsulation techniques.
5. Micropropagation: Stages I–IV, commercial applications.

UNIT-2: Gene Transfer and Industrial Plant Biotechnology

1. Gene Transfer Methods: Protoplast fusion, electroporation, particle gun method, microinjection, Agrobacterium-mediated transformation.
2. Protoplast Culture and Transformation: Isolation, PEG treatment, regeneration, selection.
3. Cell Immobilization: Techniques, matrices, applications.
4. Bioreactor: Stirred tank- monitoring parameters.
5. Industrial Applications: Secondary metabolites (cellulase and shikonin), molecular farming, algal biotechnology.

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

Examination: Semester End External - 30 marks Time: 2:00 hours

Format of Question Paper

Note:

1. Attempt all questions.
2. All questions carry equal marks

Sr. No.	Evaluation type	Marks	Module
Q.1.	Multiple Choice Question /Fill in the Blanks (Any 5 out of 10) (5 from each Module)	05	1 & 2
Q.2.	Answer in 1-2 Sentences: (Any 5 out of 10) (5 from each Module)	05	1 & 2
Q.3.	Answer any 1 of the following. (Any 1 out of 2)	10	1
Q.4.	Answer any 1 of the following. (Any 1 out of 2)	10	2
		Total 30	

Note

1. **Equal weightage is to be given to all the Units.**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	**Marks**
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
2.	Attendance/*Viva Voce*	5
		Total 20

11 **Reference books:**

1. Plant Tissue Culture. Kalyan Kumar Day.
2. Plant Tissue Culture. M K Razdan.
3. Plant Biotechnology. B D Singh
4. Fermentation Technology. Stanbury Whittaker
5. Kunka Kamenarova, Nabil Abumhadi, Kostadin Gecheff and Atanas Atanasso. (2005). Molecular farming in plants: An approach to agricultural biotechnology. Journal of Cell and Molecular Biology 4: 77-86.

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Smt. Chandibai Himathmal Mansukhani College

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Third Year B.Sc. (Botany)

Semester- V

Vocational Skills Course

(VSC)

Title: Herbal Quality Control and Analytical Techniques

2 Credits

With effect from
Academic Year 2026-2027

Title: Herbal Quality Control and Analytical Techniques

(Course Code: CHMBOTV9)

Sr. No.	Heading	Particulars
1	Description of the Course:	This course provides practical training in the extraction, identification, and quality evaluation of herbal drugs used in pharmacognosy. Students learn conventional extraction techniques such as maceration, infusion, digestion, decoction, and percolation, along with standard methods for evaluating herbal drug quality including ash values, extractive values, loss on drying, foaming index, and TLC technique. The course also covers macroscopic, microscopic, and chemical characterization of important medicinal plants and crude drugs. Practical exposure includes the study of organized and unorganized drugs, herbarium preparation, micrometry calibration, medicinal plant documentation, and educational field or industry visits.
2	Vertical	3
3	Type & Teaching Methods	Practicum
4	Credit:	2 Credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: **CO(A)1**: To provide practical knowledge of conventional extraction methods used for isolation of active constituents from plant materials. **CO(A)2:** To develop skills in quality evaluation and standardization of herbal drugs using pharmacognostic and physicochemical parameters. **CO(A)3:** To enable study of medicinal plants and crude drugs through macroscopic, microscopic, and chemical analysis. **CO(A)4:** To train students in herbarium preparation, specimen preservation, micrometry techniques, medicinal plant documentation, and industrial exposure related to herbal drug technology	
8	**Course Outcomes (COs)**: After completing the course, students will be able to: **CO1.** perform conventional extraction techniques like maceration, infusion, decoction, and	

	percolation from plant materials. **CO2.** evaluate the quality and purity of herbal drugs using standard pharmacognostic parameters such as sensory evaluation, foreign matter analysis, loss on drying, ash values, extractive values, and foaming index. **CO3.** apply chromatographic techniques, particularly Thin Layer Chromatography (TLC), for the quality assessment of herbal formulations. **CO4.** identify and characterize medicinal crude drugs based on their macroscopic, microscopic, and phytochemical features. **CO5.** differentiate various types of starch grains and calcium oxalate crystals and recognize their significance in plant drug identification. **CO6**. analyse experimental data using spreadsheet software by calculating mean, standard deviation (SD), coefficient of variation (CV), and percentage values for quality evaluation studies. **CO7.** demonstrate skill in herbarium preparation, specimen preservation, plant documentation, and micrometry techniques used in botanical and pharmacognostic investigations. **CO8.** develop practical skills in medicinal plant identification, field documentation, and industrial exposure through herbarium submission, campus survey of medicinal plants, and field/industrial visits related to herbal drug production and quality control.
9	**Syllabus** **External Practical** 1. **Conventional Methods of extractions from plant material**: • Maceration • Infusion • Digestion • Decoction • Percolation • Hot continuous extraction by Soxhlet 2. **Quality evaluation of Herbal Drugs**: • Sensory Evaluation • Determination of foreign matter

- Determination of Loss on Drying (LOD)
- Determination of total Ash content
- Determination of Alcohol soluble and Water soluble extractive values
- Determination of foaming index
- Thin Layer Chromatography of herbal formulation

3. Macroscopic/ Microscopic characters and Chemical tests for active constituents of the following:

- *Adhatoda vasaca* leaves
- *Eugenia caryophyllata* flower bud
- *Curcuma longa* rhizome
- *Cinnamon* bark
- *Foeniculum vulgare* fruit
- *Strychnos nux-vomica* seeds

4. Study of different types of starch grains and Calcium oxalate crystals
5. Calculate mean, standard deviation (SD), coefficient of variation (CV), and percentages for replicate measurements. (Using Excel)

Internal Practical

- Herbarium technique and specimen preservation
- Calibration of stage and ocular (Micrometry)
- Thin Layer Chromatography of Curcumin/fatty acids
- Submission of 05 Herbarium sheets
- Documentation of 10 medicinal plants from college campus
- Field visit/Herbal Drug Industry visit

10

Scheme of Examination and Assessment Pattern
Paper – 50 Marks
Examination: Semester End External - 30 marks Time: 2:00 hours
Format of Question Paper

Note:

1. Attempt all questions.
2. All questions carry equal marks

Sr. No.	Evaluation type	Marks

	Q.1.	Major experiment	08
	Q.2.	Minor experiment	06
	Q.3.	Identification	09
	Q.4.	Viva	03
	Q.5.	Journal	04
	Total 30		

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	**Marks**
1.	Internal Experiment-1	10
2.	Submission	5
3.	Attendance	5
	Total 20	

11 **Reference books:**

1. Trease and Evans Pharmacognosy (2009),W.C. Evans (reviser); originally G.E. Trease, Saunders (Elsevier imprint)
2. Pharmacognosy (1980), C.K. Kokate, A.P. Purohit, and S.B. Gokhale, Nirali Prakashan
3. Practical Pharmacognosy: Techniques and Experiments (2023), K. R. Khandelwal and V. Sethi, Nirali Prakashan

Botany BOS Committee:

Sr No	Name of the Faculty	Designation and College
1.	Dr. Lal Sahab Yadav	**Head of Department & Chairperson BOS**
2.	Prof. Anil Avhad	**Subject Expert VC Nominee Mumbai University** **R. J. College, Ghatkopar Mumbai**
3.	Prof. K.N. Borse	**Subject Expert from outside the parent University** **SSVVPS Science College Dhule**
4.	Dr. Suvarna Sharma	**Subject Expert from outside the parent University** **K. C. College, Charch Gate Mumbai**
5.	Mr. Prashant Patil	**Smt. CHM College**
6.	Dr. Darshana Patil	**Smt. CHM College**
7.	Dr. Lakshmi Girish	**Smt. CHM College**
8.	Dr. Satish Mourya	**Industry Representative Alumni** **Hi-Media, Thane**
9.	Dr. Rajani Shirshat	**Alumni** **V.Z. Kelkar College, Mulund**

Members of Botany Department

Sr. No	Name of the Faculty	Designation and College	Signature
1.	Dr. Lal Sahab Yadav	Head & Associate Professor Smt. CHM College, Ulhasnagar	
2	Mr. Prashant Patil	Assistant Professor Smt. CHM College, Ulhasnagar	
3	Dr. Darshana Patil	Associate Professor Smt. CHM College, Ulhasnagar	
4	Dr. Lakshmi Girish	Associate Professor Smt. CHM College, Ulhasnagar	

Name & Signature of the BoS Chairperson: DR. LALSAHAB YADAV

Name & Signature of the Dean: Dr. NEENA ANAND

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Third Year B.Sc. (Botany)

Semester- V

Vertical-4

Title: Cocurricular Course

2 Credits

Course Code: CHMCCV

With effect from
Academic Year 2026-2027

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Third Year B.Sc. (Botany)

Semester- V

Vertical-5

Title: Project: FP/CEP

2 Credits

Course Code: CHMBOTV10

With effect from
Academic Year 2026-2027

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Smt. Chandibai Himathmal Mansukhani College

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Third Year B.Sc. (Botany)

Paper-I

Semester- VI

Title: Plant Systematics & Ecology
2 Credits

with effect from
the Academic Year 2026-2027

Title: Plant Systematics & Ecology
(Course Code: CHMBOTVI1)

Sr. No.	Heading	Particulars
1	Description of the Course:	This course provides a comprehensive understanding of **Plant Systematics, Ecology, Phytogeography, Bioremediation, and Embryology**, enabling students to explore plant diversity, classification, ecological interactions, geographical distribution, and reproductive biology. The course introduces the principles of the **International Code of Nomenclature (ICN)**, plant classification systems, and the economic importance of major angiosperm families. It further examines community ecology, ecological succession, biodiversity conservation, and the role of plants in environmental remediation. Students gain insights into the phytogeographical regions of India and Maharashtra, biodiversity hotspots, mangrove ecosystems, and conservation of rare, endangered, and threatened plant species. The embryology component focuses on the structure and development of reproductive organs, fertilization, and embryo development in flowering plants. The course integrates taxonomic, ecological, geographical, and developmental perspectives to enhance understanding of plant diversity, conservation, and sustainable environmental management.
2	Vertical	1
3	Type & Teaching Methods	Theory, Inquiry-based learning
4	Credit:	2 Credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: **To enable the learner to** **CO(A)1:** To understand the principles of plant nomenclature, typification, classification systems, and the economic importance of selected angiosperm families.	

	CO(A)2: To examine ecological concepts, community characteristics, succession processes, and species interactions within plant communities. **CO(A)3:** To explore the principles, mechanisms, and applications of bioremediation and phytoremediation in environmental pollution management and ecosystem restoration. **CO(A)4:** To acquire knowledge of phytogeographical regions, biodiversity conservation, mangrove ecosystems, biodiversity hotspots, and the embryological processes of flowering plants.
8	**Course Outcomes**: After completion of course,Students will be able to: **CO1**: explain the rules of botanical nomenclature, classify plants using standard systems, and recognize the economic significance of major plant families. **CO2**: analyze ecological communities using qualitative and quantitative parameters and interpret different types of ecological succession. **CO3**: assess the role of microorganisms and plants in bioremediation and phytoremediation for environmental sustainability. **CO4**: describe the phytogeographical distribution of plants, identify biodiversity conservation priorities, and explain the developmental processes of ovules, fertilization, and embryo formation in angiosperms.
9	**Syllabus** **UNIT- I: Plant Systematics** 15 L 1. Introduction and Preamble of ICN (International Code of Nomenclature for algae, fungi, and plants), Madrid, 2024, Principles of ICN, Typification, types of Names, Rule of Priority, Effective and valid publications. 2. Outline of Hutchinson system of Classification: Principle, Merits & Demerits. 3. Families and their economic importance: According to Betham and Hooker classification; Apiaceae, Asclepiadaceae, Solanaceae, Euphorbiaceae, Arecaceae, Cannaceae. **UNIT-2: Ecology, Phytogeography, Embryology (15 L)** **Ecology** **1.** Community Ecology: Succession Processes in succession, Types of succession (Hydrosere and Xerosere) **2.** Community characteristics - • Qualitative characters: Growth forms, Species diversity • Quantitative characters: Frequency, Density, species abundance, • Community gradient and boundaries: Ecotone, Edge effect, ecological indicators, concept of Keystone species **Bioremediation:**

1. Introduction, principle, Factors affecting bioremediation, Strategies of bioremediation, Mechanisms (bioaccumulation, biosorption, biodegradation).

2. Phytoremediation - Concept and importance, Hyperaccumulator plants, mechanisms involved in pollution removal. (4 L)

Phytogeography:

1. Phytogeographic regions of India, Indigenous Plants of India, RET species of Maharashtra. Mangroves forest; Distribution in India & Ecological services.

2. Study of Biodiversity hotspots of Maharashtra: Western Ghats, Kas Plateaus

Embryology:

1. Microsporangium, Megasporangium, Types of ovules, Double fertilization, structure of embryo (Dicot and Monocot).

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

Examination: Semester End External - 30 marks Time: 1:00 hours

Format of Question Paper

Note:

1. Attempt all questions.
2. Draw neat and labelled diagrams wherever necessary.

Sr. No.	Evaluation type	Marks
Q.1.	Multiple Choice Question /Fill in the Blanks (Any 5 out of 10) (5 from each Module)	5 (Module 1&2)
Q.2.	Answer in 1-2 Sentences: (Any 5 out of 10) (5 from each Module)	5 (Module 1&2)
Q. 3.	Answer any 1 of the following. (Any 1 out of 2)	10 (Module 1)
Q.4.	Answer any 1 of the following. (Any 1 out of 2)	10 (Module 2)

Note

1. **Equal weightage is to be given to all the Units.**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	**Marks**
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
2.	Attendance/*Viva Voce*	5
		Total 20

11	**Reference books:** ● Bhattacharya, K. (1985). A Text Book of Palynology. New Central Book Agency Pvt. Ltd., Kolkata. ● Singh, G., Pandey, B. P., & Jain, P. C. (2016). A Textbook of Botany. Rastogi Publications, Meerut. ● Arnold, C. A. (1947). An Introduction to Paleobotany. McGraw-Hill Book Company, New York. ● Banerjee, P. K. (2003). Introduction to Biostatistics. S. Chand & Company Ltd., New Delhi. ● Bhojwani, S. S., & Bhatnagar, S. P. (2008). The Embryology of Angiosperms (5th ed.). Vikas Publishing House Pvt. Ltd., New Delhi. ● Cooke, T. (1901–1903; Reprint 1950). The Flora of the Presidency of Bombay. Botanical Survey of India, Kolkata. ● Cutter, E. G. (1969). Plant Anatomy, Part I. Addison-Wesley Publishing Company, Reading, Massachusetts. ● Eames, A. J., & MacDaniels, L. H. (1972). An Introduction to Plant Anatomy. Tata McGraw-Hill Publishing Company, New Delhi. ● Erdtman, G. (1952). Pollen Morphology and Plant Taxonomy. Hafner Publishing Company, New York. ● Esau, K. (1953). Plant Anatomy. John Wiley & Sons, New York. ● Fahn, A. (1974). Plant Anatomy. Pergamon Press, New York. ● Gangulee, H. C., Das, K. S., & Dutta, C. T. (2017). College Botany, Volumes I & II. New Central Book Agency, Kolkata. ● Gray, P. (1954). Handbook of Basic Microtechnique. Tata McGraw-Hill Publishing Company, New Delhi. ● Hill, A. F. (1952). Economic Botany. Tata McGraw-Hill Publishing Company Ltd., New Delhi. ● Ignacimuthu, S. (1996). Bioinformatics. Narosa Publishing House, New Delhi. ● Jain, S. K., & Mudgal, V. (1999). A Handbook of Ethnobotany. Bishen Singh Mahendra Pal Singh, Dehradun. ● Lakshminarasimhan, P. (1996). Flora of Maharashtra State: Monocotyledons. Botanical Survey of India, Kolkata.

- Lawrence, G. H. M. (1951). Taxonomy of Vascular Plants. Oxford & IBH Publishing Company, New Delhi.
- Maheshwari, P. (1950). An Introduction to the Embryology of Angiosperms. McGraw Hill Book Company, New York.
- Mondal, A. K. (2010). Advanced Plant Taxonomy. New Central Book Agency, Kolkata.
- Naik, V. N. (1984). Taxonomy of Angiosperms. Tata McGraw-Hill Publishing Company, New Delhi.
- Peacock, H. J. (1966). Elementary Microtechnique. Emkay Publications, New Delhi.
- Raup, D. M., & Stanley, S. M. (2004). Principles of Paleontology. CBS Publishers & Distributors, New Delhi.
- Saxena, N. B., & Saxena, S. (2006). Plant Taxonomy. Pragati Prakashan, Meerut.
- Sharma, A. K., & Sharma, R. (2002). Taxonomy. Pragati Prakashan, Meerut.
- Shukla, M. A., & Sharma, M. (1992).Plant Fossils. Oxford & IBH Publishing Company, New Delhi.
- Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford & IBH Publishing Company, New Delhi.
- Singh, N. P., Lakshminarasimhan, P., Karthikeyan, S., & Prasanna, P. V. (2000–2001).
- Flora of Maharashtra State: Dicotyledons, Volumes I & II. Botanical Survey of India, Kolkata.
- Sporne, K. R. (1966). The Morphology of Pteridophytes. B. I. Publications, New Delhi.
- Sporne, K. R. (1971). The Morphology of Gymnosperms. Hutchinson University Library, London.
- Stewart, W. N., & Rothwell, G. W. (2005). Paleobotany and the Evolution of Plants (2nd ed.). Cambridge University Press, Cambridge.
- Sundararajan, S. (2004). Bioinformatics. Narosa Publishing House, New Delhi.

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Third Year B.Sc. (Botany)

Practical-I

Semester- VI

Title: Practicals in Plant Systematics and Ecology

2 Credits

with effect from
the Academic Year 2026-2027

Title: Practicals in Plant Systematics and Ecology
Course Code: CHMBOTVI2

Sr. No.	Heading	Particulars
1	Description of the Course:	This practical course provides hands-on training in plant systematics, embryology, ecology, and plant anatomy with special reference to ecological adaptations and environmental analysis. Students will study the morphological and floral characteristics of important angiosperm families along with their economic importance. The course includes microscopic examination of microsporogenesis, megasporogenesis, and embryo development in dicot and monocot plants using permanent slides and photomicrographs. Students will also learn ecological tools such as Shannon diversity index for species diversity assessment and estimation of BOD and DO for water quality analysis. Anatomical adaptations of hydrophytes, halophytes, epiphytes, and xerophytes will be studied to understand plant survival strategies in different habitats. In addition, the course introduces phytogeographical regions of India and Maharashtra, enabling students to relate plant distribution patterns with environmental and climatic conditions.
2	Vertical	1
3	Type & Teaching Methods	Practicum
4	Credit:	2 Credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: **CO(A)1: To** identify and describe morphological and floral characteristics of selected angiosperm families along with their economic importance. **CO(A)2:** To understand developmental stages of plant reproduction through study of microsporogenesis, megasporogenesis, and embryo development using microscopic techniques. **CO(A)3:** To apply ecological methods such as Shannon diversity index and water quality analysis (BOD and DO) for assessing environmental conditions. **CO(A)4:** To examine anatomical adaptations of plants in different habitats and understand phytogeographical distribution patterns in India and Maharashtra.	

8 **Course Outcomes:** After completion of course,Students will be able to:

CO1: Identify and describe key morphological and floral features of major angiosperm families and relate them to their economic uses.

CO2: Demonstrate understanding of plant reproductive development by interpreting slides and photomicrographs of microsporogenesis, megasporogenesis, and embryo formation.

CO 3: Calculate and interpret ecological indices and water quality parameters such as Shannon diversity index, BOD, and DO for environmental assessment.

CO 4: Analyze anatomical adaptations of hydrophytes, xerophytes, halophytes, and epiphytes and relate them to phytogeographical distribution and ecological conditions.

9

Syllabus

Practical External:

1. Study of Morphological, Floral Formula and economic Importance of following Family: Apiaceae, Asclepiadaceae, Solanaceae, Euphorbiaceae, Arecaceae, Cannaceae.
2. Study of Dicot and Monocot embryo
3. Study of various stages of Microsporogenesis, Megasporogenesis and Embryo Development with the help of permanent slides / photomicrographs.
4. Study of Species Diversity using Shannon Indices.
5. Estimation of BOD and DO of waste water.
6. Study of anatomy of ecological adaptation in: a. Hydrophytes: Lotus petiole, b. Halophytes: Avicennia leaf, c. Epiphytic Roots: *Vanda*, d. Xerophytes: *Opuntia* phyloclade / *Nerium* leaf.
7. Phytogeographical regions of India

Internal Practical:

1. Identification of Genus and species of the campus plants using Flora
2. Study of Cell Inclusions (Sphaeraphides, cystoliths, Raphides, Sclereids)
3. Study the types of ovules

Activities-

1. Collection of 10 Flowering plants and preparation of Herbarium.
2. Collection of at least one specimen of Hydrophytes, Halophytes, Epiphytes, Xerophytes

10

Scheme of Examination and Assessment Pattern
Practical Paper – 50 Marks
Semester End Practical exam - 50 marks Time: 3:00 hours
Format of Question Paper

Question No	Questions	Marks
Q.1.	Classify specimen 'A' up to their family with reasons. Give the floral formula, Sketch neat and labeled L.S. of flower and T.S. ovary	06
Q.2.	Perform the given experiment 'B'	07

Q.3.	Calculate Shannon Diversity index from the given data C.	04
Q.4.	Identify and comment on the phytogeographical region of India from the given map D.	04
Q. 5	Identify and comment on slides /specimens/Photograph E & F	06
Q.6	Journal	03
		Total 30

Key:
A- Apiaceae, Asclepiadaceae, Solanaceae, Euphorbiaceae, Arecaceae, Cannaceae
B- BOD, DO
C- Shannon Diversity Index Angiosperm family
D- Phytogeographical region of India/Maharashtra E- Dicot and Monocot embryo/Study of various stages of Microsporogenesis, Megasporogenesis and Embryo Development F- Ecological adaptations

Note

1. 75% attendance in practical is compulsory
2. Practical journal is must for practical examination
3. Journal should be certified by Head of Department

	Internal Examination: Continuous Evaluation - 20 marks	
1.	Students should submit a comparative chart of the families of Angiosperms from the syllabus. **OR** Preparation of e flora of different locations in the campus	10
2.	Submission of case studies on bioremediation/submission of detailed report on any geographical regions of Maharashtra. **OR** Submission of analysis report of DO and BOD for 5 water samples collected from local areas.	10
	Total	20

11 Reference books:

1. Pandey, B. P. (2018). A Textbook of Botany: Angiosperms – Taxonomy. S. Chand & Company Ltd., New Delhi.
2. Bendre, A., & Kumar, A. (2016). Practical Botany – Angiosperms. Rastogi Publications, Meerut.
3. Bentham, G., & Hooker, J. D. (1862–1883). Genera Plantarum. Reeve & Co., London.
4. Bhojwani, S. S., & Bhatnagar, S. P. (2015). The Embryology of Angiosperms. Vikas Publishing House, New Delhi.
5. Cooke, T. (1958). The Flora of the Presidency of Bombay. Botanical Survey of India, Kolkata.
6. Esau, K. (1977). Anatomy of Seed Plants (2nd ed.). John Wiley & Sons, New York.
7. Gangulee, H. C., Das, K. S., & Dutta, C. T. (2017). College Botany – Volume I. New Central Book Agency, Kolkata.

	8. Johri, B. M., Ambegaokar, K. B., & Srivastava, P. S. (1992). Comparative Embryology of Angiosperms. Springer-Verlag, Berlin. 9. Mani, M. S. (2012). Ecology and Biogeography in India. Springer, Dordrecht. 11. 10. Naik, V. N. (1998). Flora of Marathwada. Amrut Prakashan, Aurangabad. 13. 11. Sane, H., Mahajan, D. R., & Khairnar, R. (Latest ed.). Practical Botany – Plant Systematics. Vision Publications, Pune. 12. Singh, G. (2019). Plant Systematics: Theory and Practice. Oxford University Press, New Delhi. 13. Trivedy, R. K., & Goel, P. K. (1986). Chemical and Biological Methods for Water Pollution Studies. Environmental Publications, Karad.

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Third Year B.Sc. (Botany)

Paper-II

Semester- VI

Title: Genetics and Molecular Biology
2 Credits

with effect from
the Academic Year 2026-2027

Title: Genetics and Molecular Biology
Course Code: CHMBOTVI3

Sr. No.	Heading	Particulars
1	Description of the Course:	This course offers an in-depth exploration of classical and molecular genetics, addressing key concepts like linkage, crossing over, chromosomal mapping, and gene mutations, while offering insights into mutagens, DNA damage repair mechanisms, and the molecular causes of genetic disorders; additionally, it introduces recombinant DNA technology alongside key molecular biology tools and techniques,, enabling learners to refine their skills in analyzing genetic information and experimental outcomes, particularly in the contexts of biotechnology, medicine, and agriculture, and promotes critical thinking regarding the molecular aspects of heredity and the ethical dilemmas surrounding genetic engineering and genomics. There is increasing demand for genetics expertise in biotechnology companies, pharmaceutical industries, genetic testing laboratories, agricultural research organizations, and biomedical research institutions. Career opportunities include genetic research assistant, biotechnology analyst, molecular biology technician, plant breeding specialist, laboratory technologist, and roles in genomics and biotechnology industries.
2	Vertical	1
3	Type & Teaching Methods	Theory, Inquiry-based learning
4	Credit:	2 Credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives:** **CO(A)1:** To understand principles of genetic linkage, crossing over, chromosomal mapping, and gene mutations.	

	CO(A)2: To explain DNA repair mechanisms and genetic metabolic disorders. **CO(A)3:** To describe the genetic code, translation process, and interpret regulation of gene expression. **CO(A)4:** To discuss recombinant DNA technology and tools in molecular biology.
8	**Course Outcomes**: After completion of course, students 'will be able to: **CO1:** describe linkage, crossing over, chromosomal mapping, and gene mutations. **CO2:** analyse DNA repair pathways and genetic defects to metabolic disorders. **CO3:** discuss the genetic code, translation process, and mechanisms of gene expression regulation. **CO4:** apply recombinant DNA and molecular biology tools
9	**Syllabus** **UNIT- I: Genetics** **Linkage, Crossing Over and Chromosomal Map:** ● **Linkage:** Definition, Introduction, Type (Complete and Incomplete), Example: Linkage in Drosophila (T. H. Morgan Experiments), Linkage in Sweet Pea (Bateson and Punnet Experiment). ● **Crossing Over:** Definition, Introduction, Type (Single, Double and Multiple), Example: Creigthon and Mc Clintocks Experiment – Maize ● **Chromosomal Map:** Definition, Concept, Three-point test cross, problem based on three-point test cross. ● **Human Genome Project:** History, Development and Applications. **Gene Mutation and Mutagen:** ● **Mutation:** Definition, Introduction, Types of Gene mutations and Concept: i. Point Mutation and its type: Transition, Transversion ii. Spontaneous iii. Induced ● **Mutagen:** Definition, Introduction, Concept of Mutagenesis. **Types of Mutagens:** i. Physical: Radiation: UV rays, X-rays. ii. Chemical: Base Analogue, Base modifying agent. iii. Biological: Transposons and Insertion sequences (IS) ● **Ames test** for mutagenicity. **DNA Repair Mechanism and Genetic Metabolic Disorders** ● DNA Repair Mechanism: Introduction and Concept, Photo-reactivation, Base excision repair, Nucleotide excision repair. ● One Gene One Enzyme: Garrod's hypothesis. ● Metabolic Disorders: Genetic cause, Diagnosis ● Amino acids metabolism: Phenylketonuria **UNIT- 2: Molecular Biology**

Gene Regulation and Expression:

- **Genetic Code:** Definition, Introduction, and properties.
- **Gene Regulation:** Definition, Introduction, Gene on off Mechanism (Operon Concept).
- **Translation in Eukaryotes:** Initiation, Elongation, and Termination. Recombinant DNA Technology:
- **Recombinant DNA technology:** Definition, Introduction, Concept of gene cloning.
- **Concept of DNA Libraries**.

Tools in Molecular Biology:

- **PCR:** Introduction, Principles, Procedures/step and applications.
- **DNA Sequencing:** Introduction, principles, Procedures/step and applications.
  i. First-generation (Maxam-Gilbert, Sanger)
  ii. Second-generation (Pyrosequencing)
  iii. Third generation (PacBio / Oxford Nanopore)
- **DNA barcoding:** Definition, Introduction and Applications.
- **CRISPR-cas Assisted Gene Cloning:** Introduction, principle, and applications.

10

Scheme of Examination and Assessment Pattern
Paper – 50 Marks
Examination: Semester End External - 30 marks Time: 2:00 hours
Format of Question Paper

Note:

1. Attempt all questions.
2. All questions carry equal marks

Sr. No.	Evaluation type	Marks	Module
Q.1.	Multiple Choice Question /Fill in the Blanks (Any 5 out of 10) (5 from each Module)	5	1 & 2
Q.2.	Answer in 1-2 Sentences: (Any 5 out of 10) (5 from each Module)	5	1 & 2
Q.3.	Answer any 1 of the following. (Any 1 out of 2)	10	1
Q.4.	Answer any 1 of the following. (Any 1 out of 2)	10	2
		Total 30	

Note

1. **Equal weightage is to be given to all the Units.**
2. **Individual Passing in Internal and External Examination.**

Internal Examination: Continuous Evaluation - 20 marks

		Assessment / evaluation	**Marks**
	1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
	2.	Attendance/*Viva Voce*	5
			Total 20

11

Reference books:

- Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., & Doebley, J. 2005 An Introduction to Genetic Analysis — W.H. Freeman.
- Classic, widely used genetics textbook.
- Hartwell, L.H., Goldberg, M.L., Lewis, J.A., et al. 2020 7th edition Genetics: From Genes to Genomes — McGraw-Hill.
- Watson, J.D., Baker, T.A., Bell, S.P., et al.2014 7th edition Molecular Biology of the Gene — Pearson.
- Alberts, B., Johnson, A., Lewis, J., et al. 4th edition 2002 Molecular Biology of the Cell — Garland Science.
- Lodish, H., Berk, A., Kaiser, C.A., et al.2005 5th edition Molecular Cell Biology — W.H. Freeman.
- Watson, J.D., Yashpal, M., & Chatterjee, D. 9th edition 2026. Molecular Biology of the Gene: An Indian Adaptation — CBS Publishers
- Parihar, P. 2005 A Textbook of Basic and Molecular Genetics — IBP Books
- Annu Choudhary, Randhir Kumar & Shreya Sahu 2025. Microbial Genetics and Molecular Biology — IIP Books

- Rehana Khan. 2022. A Textbook of Biotechnology, Volume 1: Genetics and Molecular Biology — Laxmi Publications
- Arumugam N and Meyyan R. P. (2014). Cell Biology, Molecular Biology, Genetics, Evolution and Ecology Vol. 01. Saras Publication. Edition I
- Eldon John Gardner, Michael J. Simmons, D. Peter Snustad (2005) Principals of Genetics, Eight Edition Wiley India.
- Benjamin A. Pierce (2012). Genetics: a conceptual approach. 4. ed., internat. ed. Basingstoke: Palgrave.
- Russell, P. J. (2016). Genetics: A conceptual approach (12th ed.). Pearson Education India.
- Gerald Karp (2007). Cell Biology. Seventh Edition, Wiley.
- Christoffersen, H. M. (2020). Gene Mutations. Nova Science Publishers, Incorporated.
- Hartl, D. L., & Ruvolo, M. (2012). Genetics: Analysis of genes and genomes (8. ed). Jones & Bartlett Learning.
- Lee, B., & Scaglia, F. (Eds.). (2015). Inborn errors of metabolism: From neonatal screening to metabolic pathways. Oxford University Press.
- Perdew, G. H., Heuvel, J. P., & Peters, J. M. (Eds.). (2007). Regulation of Gene Expression: Molecular Mechanisms. Humana Press. https://doi.org/10.1007/978 1-59745-228-1

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College

(Autonomous)

Affiliated to the University of Mumbai

Third Year B.Sc. (Botany)

Practical-II

Semester- VI

Title: **Practicals in Genetics, Molecular Biology and Biostatistics**

2 Credits

with effect from
the Academic Year 2026-2027

Title: Practicals in Genetics, Molecular Biology and Biostatistics
(Course Code: CHMBOTVI4)

Sr. No.	Heading	Particulars
1	Description of the Course:	his practical course provides hands-on training in Genetics, Molecular Biology, and Biostatistics through experimental, analytical, and computational approaches. It includes cytogenetic studies, DNA isolation and analysis, mutation and linkage mapping, DNA sequence interpretation, phylogenetic analysis, and statistical evaluation of biological data. The course develops laboratory proficiency, bioinformatics skills, data analysis, and scientific reporting essential for contemporary biological research
2	Vertical	1
3	Type & Teaching Methods	Practical, Inquiry-based learning
4	Credit:	2 Credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: **CO(A)1:** To understand chromosomal anomalies using pre-treated plant materials **CO(A)1:** To conduct separation technique for genomic and plasmid DNA **CO(A)1:** To demonstrate types of mutations and DNA barcoding **CO(A)1:** To practice statistical analysis of biological data using t-test and ANOVA	
8	**Course Outcomes:** After completion of course, students will be able to: **CO1:** interpret effect of C-mitosis and PDB **CO2:** identify and visualise separation technique and plasmid DNA **CO3:** interpret types of mutation and perform DNA barcoding **CO4:** analyse biological data using t-test and ANOVA	
9	**Syllabus** **Practical External**: 1. Study of the effect of PDB in mitosis using suitable plant materials. 2. Separation and visualization of genomic DNA using Agarose gel (Demonstration). 3. Construct linkage map using three-point test cross data. 4. Study of different types of point mutations (Transversions and transitions; consequences at protein level) 5. BLAST 6. Construction on Phylogenetic tree using suitable software for DNA barcoding	

7. Biostatistics: t-test (paired and unpaired)
8. Biostatistics: ANOVA (One Way)

Practical Internal:

1. Designed polypeptide from given mRNA/DNA sequences data sheet.
2. Interpretation of Autoradiogram by Sanger's Sequencing Method.
3. Interpretation of Pyrogram by Pyro Sequencing Method.
4. Tools in molecular biology: PCR and Vector.
5. Report writing on Plant mutant phenotype by online data any five plant.

10

Scheme of Examination and Assessment Pattern
Practical Paper – 50 Marks
Semester End Practical exam - 50 marks Time: 3:00 hours
Format of Question Paper

Question No	Questions	Marks
Q.1.	Prepare squash from the material 'A' Draw and comment on the stage observed.	06
Q.2.	Perform the experiment 'B'	08
Q.3.	Perform the experiment 'C'	05
Q.4.	Solve biostatistics problem 'D'	08
Q.5.	Journal	03
		Total 30

Key:
A- Treated root tips (PDB)
B- Construct linkage map using three-point test cross data.
C- Mutation type (Transversions / Transitions - 2 examples) / DNA Barcoding
D- t-test (paired / unpaired) / ANOVA

Note

1. 75% attendance in practical is compulsory
2. Practical journal is must for practical examination
3. Journal should be certified by Head of Department

	Internal Examination: Continuous Evaluation - 20 marks	
1.	Construct linkage map using three-point test cross data OR Design polypeptide from given mRNA/DNA sequences data sheet	05
2.	Interpretation of Autoradiogram by Sanger's Sequencing Method OR Interpretation of Pyrogram by Pyro Sequencing Method	04
3.	Tools in molecular biology: PCR	05
4.	Report writing on Plant mutant phenotype by online data (any five plant)	06

	Total 20
11	Reference books: 1. Ali, S. M., & Hussain, S. Y. (2009). Practical manual of biotechnology. Aavishkar Publishers. 2. Ashwani Kumar S.K. Gakhar, Monika Miglani. (n.d.). Molecular Biology: A Laboratory Manual. WILEY INDIA. 3. Dr. P. V. G. K. Sarma. (2023). Molecular Biology a Practical Manual. M J P Publishers. 4. Pranav Kumar, Usha Mina, & Praveen Verma. (2024). Biotechnology – A Problem Approach. Pathfinder Publication, a unit of Pathfinder Academy Pvt. Ltd; 6th Edition: Pathfinder Publication. 5. Singh, B. R., & Kumar, R. (2021). Practical techniques in molecular biotechnology. Cambridge University Press. https://doi.org/10.1017/9781108659161 6. Sunil D Purohit & Neelu Joshi. (2007). Molecular Biology & Biotechnology. A textbook of practical Botany, Vol-1 &2 Rastogi Publication.

HSNC Board's

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Third Year B.Sc. (Botany)

Paper-III

Semester- VI

Title: Medicinal Botany and Ayurveda Shastra
2 Credits

with effect from
the Academic Year 2026-2027

Title: Medicinal Botany and Ayurveda Shastra
(Course Code: CHMBOTVI5)

Sr. No.	Heading	Particulars
1	Description of the Course:	This course introduces the historical foundations of Indian medicinal systems through classical texts such as the Charaka Samhita and the Sushruta Samhita. It covers key medicinal plants, their phytochemistry and therapeutic uses, and explores Ayurvedic food science and dietary management. The course connects traditional knowledge with modern pharmacognosy and sustainable healthcare practices. Students can pursue careers in herbal and Ayurvedic industries, pharmacognosy research, medicinal plant cultivation, herbal product quality control, and natural health product development.
2	Vertical	1
3	Type & Teaching Methods	Theory, Inquiry-based learning
4	Credit:	2 Credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: **CO(A)1:** To introduce historical contexts and classical texts of Indian medicinal systems. **CO(A)2:** To describe key medicinal plants, including phytochemistry and uses. **CO(A)3:** To explore food science and dietary management in Ayurveda. **CO(A)4:** To connect traditional knowledge with modern pharmacognosy.	
8	**Course Outcomes**: After completing the course, students will be able to: **CO1:** identify and differentiate medicinal crude drugs based on their morphological, anatomical, phytochemical and pharmacognostic characteristics. **CO2:** Analyze the relationship between phytochemical constituents of medicinal plants and their therapeutic applications in traditional and modern healthcare systems. **CO3:** Classify vegetable fats and oils based on their origin, chemical nature, and drying properties, and describe their medicinal and industrial importance.	

	CO5: Describe the historical development, fundamental concepts, branches, and contemporary relevance of Ayurveda, including the role of AYUSH and the Traditional Knowledge Digital Library (TKDL). **CO6**: Evaluate the contributions of ancient Indian scholars such as Charaka and Sushruta to traditional medicine. **CO7**: Interpret the Ayurvedic concepts of Tridosha, Panchamahabhuta, Saptadhatu, Agni, Ojas, Mala, Srotas, Manas, and Prakrti, and relate them to health and disease management. **CO8**: Apply the principles of Ayurvedic lifestyle management, including dietary concepts, Dinacharya, and Ritucharya, for promoting health, well-being, and disease prevention.
9	**Syllabus** **UNIT- 1:Medicinal Botany** ● Monograph of drugs with respect to Biological source, Geographical distribution, macro and microscopic characters, chemical constituents and therapeutic uses of the following drugs: *Zingiber officinale* (rhizome) *Ocimum sanctum* (Leaf) *Phyllanthus emblica* (fruit) *Plantago ovata* (seed) ● Vegetable Fats and oils: Introduction to vegetable Fats and oils, Classification of vegetable Fats and oils Vegetable Fats: Coconut and Palm oil Fatty oils: Drying oil (Linseed and Safflower oil), Semidrying oils (Sunflower oil and Sesame oil) and Non-drying oils (Olive oil and Peanut oil) **UNIT-2: 2 Basics of Ayurveda Shastra** ● Introduction to Ayurveda: Historical Evolution, Major Milestones, Astanga Ayurveda, Strengths of Ayurveda, Initiatives of Indian Government for promotion and propagation of Ayurveda (AYUSH), Traditional Knowledge Digital Library (TKDL) ● Contribution of Ancient Indian Scholars to Botany: Sushruta and Charaka ● Classification of Plants based properties, habit, habitat and morphology characters ● Basic Principles of Ayurveda: Panchamahabhuta, Svasthya, Tridosa, Saptadhatu, Ojas, Mala, Srotas, Agni, Manas, Prakrti ● Lifestyle Management: Food-Six tastes of food items, Eight factors of diet and

dietetics, Diet and Mind, Dinacharya

- Dincharya & Ritucharya (Daily & Seasonal Regimens)

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

Examination: Semester End External - 30 marks Time: 1:00 hours

Format of Question Paper

Note:

1. Attempt all questions.
2. All questions carry equal marks

Sr. No.	Evaluation type	Marks	Module
Q.1.	Multiple Choice Question /Fill in the Blanks (Any 5 out of 10) (5 from each Module)	5	1 & 2
Q.2.	Answer in 1-2 Sentences: (Any 5 out of 10) (5 from each Module)	5	1 & 2
Q.3.	Answer any 1 of the following. (Any 1 out of 2)	10	1
Q.4.	Answer any 1 of the following. (Any 1 out of 2)	10	2
		Total 30	

Note

1. **Equal weightage is to be given to all the Units.**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	**Marks**
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
2.	Attendance/*Viva Voce*	5
		Total 20

11

Reference books:

- Jain AK. Traditional Botanical Knowledge in Ancient India. Journal of Traditional and Folk Practices (JTFP). 2013 Jan 1;1(1).

- Kumar S, Dobos GJ, Rampp T. The significance of ayurvedic medicinal plants. Journal of evidence-based complementary & alternative medicine. 2017 Jul;22(3):494-501Charaka Samhita- a scientific synopsis, P. Ray & H.N Gupta National Institute of Sciences of Indi4 New Delhi 1965.

- Rajkumar Jain 1974 Ayurveda Darshan, Anekanth Prakashan : Madya Pradesh
- Rajan, S. Sundara. 2001. Plant science. In Medicine and Life Sciences in India (Ed.) B.V.Subbarayappa. New Delhi: Munshiram Manoharlal Publishers Pvt. Pp.242-270.
- Sadhale N, Nene YL. Ancient Indian traditional and scientific thought on plants: Sir JC Bose and Vrikshayurveda. Asian Agri–History Journal. 2009 Apr 1;13(2):101-12.
- Lad V 1984Ayurveda. The science of self-healing. Lotus Press
- Dash B 1978 Fundamentals of Ayurvedic medicine. Konark Publisher
- Pandey MM, Rastogi S, Rawat AK. Indian traditional ayurvedic system of medicine and nutritional supplementation. Evidence-Based Complementary and Alternative Medicine. 2013;2013(1):376327.
- Meshram SA, Meshram AA. Vrikshayurveda - A Boon. J Ayurveda Integr Med Sci 2019;6:186-189.
- Chavda N, Rathore R, Solanki H (2022) An overview of the historical background of ethnobotany and indigenous culture of India. İnternational Journal of Creative Research Thoughts. 2022;10(4):738-51.
- Sharma IP, Kanta C, Dwivedi T, Rani R (2020) Indigenous agricultural practices: A supreme key to maintaining biodiversity. Microbiological advancements for higher altitude agro-ecosystems & sustainability. 2020:91 112.
- Patra B (2016) Environment in Early India: A Historical Perspective. Environment: Traditional & Scientific Research. 1(1):39-56.
- D. M. Bose, S. N. Sen and B. V. Subbarayappa, Eds., A Concise History of Science in India, 2nd Ed., Universities Press, Hyderabad, 2010.
- Dr. Girish Nath Jha, Dr. Umesh Kumar Singh and Diwakar Mishra, Science and Technology in Ancient Indian Texts, DK Print World limited.
- Swami BB Vishnu, Vedic Science and History - Ancient Indian's Contribution to the Modern World, gosai publication, 2015

	● Lad V 2002 Textbook of Ayurveda: fundamental principles. The Ayurvedic Press ● Sebastian Pole 2006 Ayurvedic Medicine The Principles of Traditional Practice, Elsevier Limited ● Government of India 2001 Ayurvedic pharmacopoeia of India

HSNC Board's

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Third Year B.Sc. (Botany)

Paper-IV

Semester- VI

Title: Forensic Botany and Green Economy
2 Credits

With effect from
Academic Year 2026-2027

Title: Forensic Botany and Green Economy
Course Code: CHMBOTVI6

Sr. No.	Heading	Particulars
1	Description of the Course:	This course explores the role of plants and plant-derived materials in forensic investigations and sustainable industries. Students learn how botanical evidence such as pollen, seeds, wood, leaves, and fibers can support crime investigations, while also understanding the economic importance of plant-based products in the green economy. The course covers the collection and analysis of botanical evidence, biodiversity conservation, herbal and plant-based industries, and sustainable resource management. It integrates concepts from plant science, forensic science, and environmental studies, preparing students for careers in forensic laboratories, herbal and nutraceutical industries, environmental consulting, biodiversity conservation, and green entrepreneurship.
2	Vertical	1
3	Type & Teaching Methods	Theory, Inquiry-based learning
4	Credit:	2 Credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: **CO(A)1:** Understand the principles, scope and significance of forensic botany and economic & industrial botany. **CO(A)2:** Explain the role of botanical evidence, economically important plants and plant-based industrial products in society. **CO(A)3:** Develop practical skills in collection, preservation, identification and laboratory analysis of botanical evidence using modern techniques.. **CO(A)4:** Explore the economic and industrial Botany with respect to the Indian Scenario. **CO(A)5:** Acquire the knowledge of commercially important plant products. **CO(A)6:** Comprehend processing methods and industrial applications of plant-derived products.	

8

Course Outcomes (COs): After completion of the course, the students will be able to

CO1. explain the scope, importance, and role of plants in forensic investigations and their significance in criminal justice.

CO2. apply standard methods for collection, handling, and preservation of various types of botanical evidence.

CO3. demonstrate an understanding of forensic botany techniques and interpret forensic findings through selected case studies.

CO4. analyze forensic case studies involving plant evidence and evaluate the industrial and economic significance of plant-derived products in agriculture, healthcare and Commerce.

CO5. identify and describe commercially important plant products, their botanical sources, and uses.

CO6. integrate forensic and industrial botanical knowledge to solve real-life problems, support criminal investigations and promote sustainable utilization of plant resources.

9

Syllabus

Unit-1: Forensic Botany

1. Introduction: Definition, Scope, Importance, Role of plants in investigations.
2. Disciplines of Botany in Forensics: Limnology, Plant Ecology, Plant entomology, Palynology, Plant mycology, Plant anatomy, taxonomy and Plant molecular biology
3. Types of Botanical evidence in Forensics (Leaves, Pollen, fibers, Seeds) and the Collection, handling and preservation of Botanical evidence.
4. Techniques in Forensic Botany: Microscopic study, Genomic DNA isolation, PCR amplification, DNA fingerprinting
5. Case Studies: (Sample Case studies for Reference)
    - A Case study report of acute yellow oleander accidental poisoning.
    - Botanical detectives: Harnessing plant evidence in criminal justice.

Unit- 2: Economic and Industrial Botany

- **Economic Botany**- Introduction, Botanical name, Source, Economic importance, Indian Scenario

1. Timber yielding Plants: Shisham and Teak
2. Fibres: Cotton, Jute
3. Dyes: Henna, Bixa
4. Pulses and millets: Pea, Amaranth
5. Spices and Condiments: Saffron, Cardamom

- **Industrial Botany**

1. Essential Oils: Introduction, general characteristics, Extraction methods - Hydro distillation and Steam distillation, Source and industrial applications of

Citronella, and Sandal wood oil.

1. **Plant based products**: Preparation uses and nutritional values of Plant based meat, Tofu, Peanut butter, and cheese.
2. **Bioenzymes:** Source and Applications of – Pectinase and Papain.

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

Examination: Semester End External - 30 marks Time: 2:00 hours

Format of Question Paper

Note:

1. Attempt all questions.
2. All questions carry equal marks

Sr. No.	Evaluation type	Marks	Module
Q.1.	Multiple Choice Question /Fill in the Blanks (Any 5 out of 10) (5 from each Module)	5	1 & 2
Q.2.	Answer in 1-2 Sentences: (Any 5 out of 10) (5 from each Module)	5	1 & 2
Q.3.	Answer any 1 of the following. (Any 1 out of 2)	10	1
Q.4.	Answer any 1 of the following. (Any 1 out of 2)	10	2
		Total 30	

Note

1. **Equal weightage is to be given to all the Units.**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	**Marks**
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)/ Assignment	15
2.	Attendance/*Viva Voce*	5
		Total 20

11

Reference books:

1. Bansal, A. K, 2022, Wood Production and Consumption in India during 2019 20, NCCF Policy Paper No. 1/2022, New Delhi, India.
2. Botanical detectives: Harnessing plant evidence in criminal justice. https://doi.org/10.30574/ijsra.2024.12.2.1320 3. Suicide disguised as homicide: A case report of yellow oleander poisoning, J Clin Biomed Sci 2018; 8 (3): 106 - 108

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Third Year B.Sc. (Botany)

Practical -IV

Semester- VI

Title: Practicals in Forensic Botany and Green Economy

2 Credits

With effect from
Academic Year 2026-2027

Title: Practicals in Forensic Botany and Green Economy
Course Code: CHMBOTVI7

Sr. No.	Heading	Particulars
1	Description of the Course:	This practical course provides hands-on training in forensic, economic, and industrial botany through the collection, identification, and laboratory analysis of botanical materials. Students develop skills in microscopy, chromatography, biochemical assays, plant identification, forensic evidence analysis, and preparation of selected plant-based products. The course emphasizes scientific observation, laboratory techniques, data interpretation, and the practical applications of botany in forensic investigations and plant-based industries.
2	Vertical	1
3	Type & Teaching Methods	practicum
4	Credit:	2 Credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: **CO(A)1:** Understand the principles and scope of Forensic Botany, Economic Botany, and Industrial Botany through laboratory-based learning. **CO(A)2:** Develop skills in identification and analysis of botanical evidence such as pollen, wood, and plant fibers used in forensic investigations. **CO(A)3:** Perform qualitative and chromatographic tests to study plant constituents including natural dyes, cellulose, lignin, enzymes, and essential oils. **CO(A)4:** Identify economically important plants, toxic plants, and timber-yielding species using specimens and photomicrographs. **CO(A)5:** Apply biochemical and enzymatic assays to understand industrial applications of plant-derived products. **CO(A)6:** Gain practical knowledge of plant-based food processing and sustainable product development.	
8	**Course Outcomes (COs):**After completion of the course, students should be able to: **CO1**.Analyze botanical evidence such as pollen, spores, and fibers for forensic interpretation. **CO2**. Identify toxic, economic, and timber-yielding plants using morphological and	

	microscopic features. **CO3**. Conduct qualitative biochemical tests and chromatographic techniques for plant compounds and natural products. **CO4**.Evaluate the industrial significance of plant enzymes, essential oils, dyes, and plant-based materials. **CO5**. Apply laboratory techniques to prepare plant-based food products and eco friendly materials. **CO6**. Demonstrate practical skills in plant analysis relevant to forensic, industrial, and economic botany applications.
9	**Syllabus** **External Practical** 1. Collection of pollen grains from flowers and preparation of temporary mounts. 2. Collection and microscopic study of fungal spores and pteridophytic spores as forensic indicators 3. Identification of toxic plants using specimens or photomicrographs: • *Atropa belladonna*, • *Calotropis gigantea*, • *Nerium odorum*, • *Datura stramonium*. • Poisonous Mushrooms 4. Study of diagnostic characters of selected medicinal and narcotic plants of forensic relevance **Economic Botany** 5. TLC of natural dye - lawsone (henna) 6. Detection of lignin content in coir and cotton fibers by Wiesner test. 7. Identification of economically important plants using specimens or photomicrographs.(studied in theory) **Industrial Botany** 8. Qualitative test for enzymes - Pectinase, Papain. 9. Estimation of Amylase activity. 10. TLC of essential oils - Citronella **Internal Practical** • Macroscopic and microscopic differentiation of natural and synthetic fibers. • (Natural - Cotton, Wool ; Synthetic - Nylon, Polyester) • Detect the presence of plant based evidence from the sample and comment on your findings. (Pollen, spores, fibre, etc.) **Economic Botany** • Qualitative tests for active constituents from spices and condiments, Cardamom

	Industrial Botany • Prepare a stable egg-free mayonnaise using aquafaba (chickpea cooking water) as an emulsifier. • Preparation of Tofu, vegan butter.
10	References: 1. Bansal, A. K, 2022, Wood Production and Consumption in India during 2019 20, NCCF Policy Paper No. 1/2022, New Delhi, India. 2. Botanical detectives: Harnessing plant evidence in criminal justice. https://doi.org/10.30574/ijsra.2024.12.2.1320 3. Suicide disguised as homicide: A case report of yellow oleander poisoning, J Clin Biomed Sci 2018; 8 (3): 106 – 108 3. Economic Botany

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Third Year B.Sc. (Botany)

Elective

Semester- VI

Title: Ethnobotany and Wild Edible Plants
2 Credits

with effect from
the Academic Year 2026-2027

Title: Ethnobotany and Wild Edible Plants

Course Code: CHMBOTVI8

Sr. No.	Heading	Particulars
1	Description of the Course:	This course introduces the principles of ethnobotany and wild edible plants, including but not limited to traditional knowledge systems, sacred plants, ethnomedicinal uses, and research methodologies. This course equips students with skills relevant to careers in ethnobotanical research, biodiversity documentation, conservation programs, community-based resource management, and food and nutrition projects. Graduates can work as research assistants in ethnobotany, biodiversity field surveyors, conservation project associates, nutrition and food resource analysts, and documentation specialists in research institutions, NGOs, environmental organizations, and government agencies working on traditional knowledge and biodiversity conservation. Entrepreneurial opportunities include establishing wild edible plant–based food ventures, value-added products such as herbal teas, natural nutraceuticals, pickles, preserves, and traditional health foods, as well as community-based enterprises promoting indigenous food products.
2	Vertical	1 (Elective)
3	Type & Teaching Methods	Theory, Inquiry-based learning
4	Credit:	2 Credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: **CO(A)1:** To introduce the concept, scope, significance of ethnobotany, and sources of ethnobotanical data. **CO(A)2:** To understand the significance of sacred groves, sacred plants, and ethnomedicinal wealth.	

	CO(A)3: To explain principles of post-harvest management, safety, quality control, and value addition of wild edible plants. **CO(A)4:** To sensitize the role of wild edible plants in food security, sustainable livelihoods, domestication, and entrepreneurship.
8	**Course Outcomes**: After completing the course, students will be able to: **CO1:** Explain the concept, historical development, scope, significance,contemporary relevance and interdisciplinary nature of ethnobotany in understanding plant–human interactions. **CO2:** Apply different ethnobotanical research methodologies for documenting traditional plant knowledge. **CO3:** Evaluate the ecological, cultural, religious, and conservation significance of sacred groves and analyze factors responsible for their decline and sustainable management. **CO4:** Describe the concept, diversity, nutritional significance, phytochemical composition, and pharmacological properties of wild edible plants and their role in traditional food systems. **CO7:** Assess the economic, nutritional, and medicinal importance of selected wild edible plants. **CO8:** Analyze the role of wild edible plants in food security, sustainable livelihoods, biodiversity conservation, and the preservation of indigenous knowledge systems.
9	**Syllabus** **UNIT -1- Fundamentals of Ethnobotany** 1. **Introduction**: Concept, History, scope and Significance 2. **Ethnobotany as an Interdisciplinary Science**: Ethnotaxonomy, Ethnoecology, Ethnopharmacology, Ethnomedicine, Endotoxicology, Ethnomusicology, Archaeoethnobotany, Paleoethnobotany, Ethnogynaecology, Ethnonarcotics. Ethnohorticulture, Ethnogastrology, Ethnopediatrics, Ethnoorthopaedics, Ethnomycology, Ethnoforestry, Ethnoagroforestry, -Ethno-Medico Botany 3. **Types of ethnobotanical research methods:** Ethnobotanical field work,ethnobotanical study with the help of herbaria, ethnobotanical study with the aid of literature, archaeological remains and ethnobotany, sculptures on temples, folklore in ethnobotanical work 4. **Sacred groves:** Role of temple in society, Some important temples of India, Sacred place, Causes of decline of these natural sacred sites, Importance of sacred groves,Threats to Sacred Groves, Sustainable development of the sacred grove, Status of sacred groves in India, Importance of sacred groves, Threats to Sacred Groves, conservation of sacred plants, Examples of sacred plants- *Ficus bengalensis, Musa* spp., *Ocimum sanctum, Cynodon dactylon, Agel marmelos* **UNIT- 2.- Wild Edible Plants** 1. Concept and Nutritional Significance of Wild Edible Plants: ● Introduction to wild edible plants (WEPs) ● Nutritional profiling, phytochemicals and pharmacological activities of economically important wild edible plants: *Dioscorea bulbifera* (Karande),

Momordica dioica (Kantola), *Carissa carandas* (Karavand), *Cordia dichotoma* (Bhokar)

2. Diversity of WEPs

- Trees, shrubs, herbs, climbers and ferns
- Fruits, vegetables, tubers, seeds, flowers and mushrooms
- Study of locally available wild vegetables.

- Role of wild edibles in food security and sustainable livelihoods;

- Conservation of wild edible plants

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

Examination: Semester End External - 30 marks Time: 1:00 hours

Format of Question Paper

Note:

1. Attempt all questions.
2. All questions carry equal marks

Sr. No.	Evaluation type	Marks	Module
Q.1.	Multiple Choice Question /Fill in the Blanks (Any 5 out of 10) (5 from each Module)	5	1 & 2
Q.2.	Answer in 1-2 Sentences: (Any 5 out of 10) (5 from each Module)	5	1 & 2
Q.3.	Answer any 1 of the following. (Any 1 out of 2)	10	1
Q.4.	Answer any 1 of the following. (Any 1 out of 2)	10	2
		Total 30	

Note

1. **Equal weightage is to be given to all the Units.**

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	**Marks**
1.	Class Test (Short notes/ MCQ's/ Match the Pairs/ Answer in one sentence/ Puzzles)	15
2.	Attendance/*Viva Voce*	5
		Total 20

11	**Reference books:** ● Manual of Ethnobotany, 2nd Revised Ed. By S.K. Jain ● Ethnobotany of India: Volume 1 to 5 Edited By T. Pullaiah, K. V. Krishnamurthy, Bir Bahadur ● Ethnobotany MSc Sem IV, Uttarakhand Open University, https://uou.ac.in/sites/default/files/slm/MSCBOT-608.pdf ● Sacred Plants of India by M. Amirthalingam Nanditha Krishna; Penguin Books ● Kunwar, R. (2017). Wild Edible Vegetables of Lesser Himalayas. Ethnobotancial and Nutraceutical Aspects, Volume 1. ● Kundu, B. B., Vanni, K., Farheen, A., Jha, P., Pandey, D. K., & Kumar, V. (2021). Dioscorea bulbifera L. (Dioscoreaceae): A review of its ethnobotany, pharmacology and conservation needs. South African journal of botany, 140, 365-374. ● Talukdar SN, Hossain MN. Phytochemical, phytotherapeutical and pharmacological study of Momordica dioica. Evidence-Based Complementary and Alternative Medicine. 2014;2014(1):806082. ● Singh, S., Bajpai, M., & Mishra, P. (2020). Carissa carandas L.–phyto pharmacological review. Journal of Pharmacy and Pharmacology, 72(12), 1694-1714. ● Pathak, G., Singh, S., Singhal, M., Singh, J., Hussain, Y., Gupta, M., … Rout, P. K. (2021). Pharmacology of Carissa carandas leaf extract: anti proliferative, antioxidant and antimicrobial investigation. Plant Biosystems - An International Journal Dealing with All Aspects of Plant Biology, 155(3), 543–556. https://doi.org/10.1080/11263504.2020.1762787 ● Robert Antony, A., Prasannakumar, P., Ameena, I., Sruthi, M., Merlin, T., Ardra, A. P., & Aswathy Surendran, K. (2024). Medicinal and Nutritional Importance of Amorphophallus campanulatus in Human Health. In Medicinal Plants and their

Bioactive Compounds in Human Health: Volume 1 (pp. 107-122). Singapore: Springer Nature Singapore.

- Penna S, Nikalje GC, editors. Harnessing Sesuvium Portulacastrum for Biosaline Agriculture. Springer; 2025 Apr 2.
- Nikalje GC, Chonde A, Srivastava S, Suprasanna P. Wild Vegetables: Morphology, Phytochemistry and Utility Part 1.
- Deepthi, K., Renjith, P.K., Habeeb Rahman, K. et al. A comprehensive review of Sesbania grandiflora (L.) Pers: traditional uses, phytochemistry and pharmacological properties. Vegetos 37, 31–40 (2024). https://doi.org/10.1007/s42535-023-00594-5
- Sadasivam, S. (1996). Biochemical methods. New age international.
- Ngurthankhumi, R., Hazarika, T.K., Zothansiama, Lalruatsangi, E. (2024). Nutritional composition and anti-nutritional properties of wild edible fruits of northeast India. Journal of Agriculture and Food Research, 16, 101221. [http://dx.doi.org/10.1016/j.jafr.2024.101221]
- FAO, WFP, and IFAD (2012). The State of Food Insecurity in the World 2012 Economic Growth is Necessary but Not Sufficient to Accelerate Reduction of Hunger and Malnutrition. Rome: FAO.
- Sundriyal, M., & Sundriyal, R. C. (2004). Wild edible plants of the Sikkim Himalaya: Marketing, value addition and implications for management. Economic Botany, 58(2), 300-315.
- Leakey, R., Tientcheu Avana, M.L., Awazi, N., Assogbadjo, A., Mabhaudhi, T., Hendre, P., Degrande, A., Hlahla, S., Manda, L. (2022). The future of food: Domestication and commercialization of indigenous food crops in Africa over the third decade (2012–2021). Sustainability (Basel), 144, 2355. [http://dx.doi.org/10.3390/su14042355]

- Luo, G., Najafi, J., Correia, P.M.P., Trinh, M.D.L., Chapman, E.A., Østerberg, J.T., Thomsen, H.C., Pedas, P.R., Larson, S., Gao, C., Poland, J., Knudsen, S., DeHaan, L., Palmgren, M. (2022). Accelerated domestication of new crops: Yield is key. Plant Cell Physiol, 6311, 1624 1640. [http://dx.doi.org/10.1093/pcp/pcac065] [PMID: 35583202]
- Dharmappa, K. K. (2022). Medicinal and nutritional aspects of wild edible fruits from Western Ghat of India. International Journal of Green Pharmacy (IJGP), 16(4).
- Kannan, G., Paul, B.M., Thangaraj, P. (2025). Wild Edible Fruits from the Western Ghats: A Rich Source of Bioactive Compounds with Health Promoting Effects: A Review. In: Thangaraj, P. (eds) Pomotherapeutic Insights on Wild Edible Fruits. Springer, Singapore.

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College

(Autonomous)

Affiliated to the University of Mumbai

Third Year B.Sc. (Botany)

Paper-

Semester- VI

Title: Practicals in Ethnobotany and Wild Edible Plants

2 Credits

with effect from
the Academic Year 2026-2027

Title: Practicals in Ethnobotany and Wild Edible Plants
(Course Code: CHMBOTVI9)

Sr. No.	Heading	Particulars
1	Description of the Course:	This practical course provides hands-on training in the identification, documentation, and analysis of ethnobotanical and wild edible plants of local importance. Students will learn the ethnobotanical significance and economic uses of selected plant species, conduct ethnobotanical surveys, prepare data sheets, and preserve plant specimens. The course also introduces basic phytochemical and biochemical techniques, including estimation of proteins, reducing sugars, and vitamin C, as well as qualitative analysis of alkaloids, glycosides, and tannins. Practical exposure to macroscopic, microscopic, and TLC methods enables students to evaluate plant materials and understand their medicinal and nutritional value.
2	Vertical	1
3	Type & Teaching Methods	Practicum
4	Credit:	2 Credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	**Course Objectives**: **CO(A)1:** To develop skills in identification, collection, drying, mounting, and labeling of ethnobotanical and wild edible plant materials. **CO(A)2:** To estimate nutritional components and biochemical analysis of wild edible plants. **CO(A)3:** To perform phytochemical screening and quality evaluation of ethnobotanical plant materials. **CO(A)4:** To prepare value-added products from wild edible plants.	

8 **Course Outcomes:** After completing the course, students will be able to:

CO1: identify and document ethnobotanical and wild edible plants data.

CO2: calculate and report proteins, reducing sugars and vitamin C.

CO3: analyze phytochemicals using qualitative tests, TLC, and microscopic techniques.

9

Syllabus

External Practical:

1. Identification and importance of ethnobotanical plants – Fig, Sandalwood, Lotus.
2. Identification and economic importance of Wild Edible Plants - *Dioscorea bulbifera* (Karande), *Momordica dioica* (Kantola), *Carissa carandas* (Karavand), *Amorphophallus campanulatus* (Suran), *Sesuvium portucalastrum*, *Sesbania grandiflora* (Hadga)
3. Estimation of Proteins by Lowrey's Method.
4. Qualitative tests for alkaloids, glycosides and tannins.
5. Estimation of Reducing sugars.
6. Estimation of Vitamin C.
7. Macroscopic, microscopic and TLC of medicinal plants

Internal Practical:

1. Preparation of Ethnobotanical survey questionnaire.
2. Preparation of Data Sheet of locally available ethnobotanical plants (min. 5 plants)- Local name, Botanical name, Part used, Mode of use, Medicinal uses.
3. Preservation and labeling of Wild Edible Plants/ plant parts.

10

Scheme of Examination and Assessment Pattern

Paper – 50 Marks

Examination: Semester End External - 30 marks Time: 1:00 hours

Format of Question Paper

Sr. No.	Evaluation type	Marks
Q.1.	Major Experiment-1	08
Q.2.	Major Experiment-2	08
Q.3.	Identification	9
Q.4.	Journal	05
		Total 30

Internal Examination: Continuous Evaluation - 20 marks

	Assessment / evaluation	**Marks**

	1.	Internal Experiment	10
		Report	05
	2.	Attendance/*Viva Voce*	5
			Total 20
11	Text Books / References 1. Manual of Ethnobotany, 2nd Revised Ed. By S.K. Jain 2. Ethnobotany of India: Volume 1 to 5 Edited By T. Pullaiah, K. V. Krishnamurthy, Bir Bahadur 3. Sacred Plants of India by M. Amirthalingam Nanditha Krishna; Penguin Books 4. Penna S, Nikalje GC, editors. Harnessing Sesuvium portulacastrum for Biosaline Agriculture. Springer; 2025 Apr 2. 5. Sadasivam, S. (1996). Biochemical methods. New age international. 6. Choudhary, N., Siddiqui, M. B., & Khatoon, S. (2014). Pharmacognostic evaluation of Tinospora cordifolia (Willd.) Miers and identification of biomarkers. Indian journal of Traditional knowledge, 13(3), 543-550. 7. Elsadek, M. F., & Al-Numair, K. S. (2024). Profiling of phytochemical constituents of terminalia chebula fruit extract by different solvent effects and synchronized analysis of FTIR and GCMS. Journal of King Saud University-Science, 36(9), 103414.		

Botany BOS Committee:

Sr No	Name of the Faculty	Designation and College
1.	Dr. Lal Sahab Yadav	**Head of Department & Chairperson BOS**
2.	Prof. Anil Avhad	**Subject Expert VC Nominee Mumbai University** **R. J. College, Ghatkopar Mumbai**
3.	Prof. K.N. Borse	**Subject Expert from outside the parent University** **SSVVPS Science College Dhule**
4.	Dr. Suvarna Sharma	**Subject Expert from outside the parent University** **K. C. College, Charch Gate Mumbai**
5.	Mr. Prashant Patil	**Smt. CHM College**
6.	Dr. Darshana Patil	**Smt. CHM College**
7.	Dr. Lakshmi Girish	**Smt. CHM College**
8.	Dr. Satish Mourya	**Industry Representative Alumni** **Hi-Media, Thane**
9.	Dr. Rajani Shirshat	**Alumni** **V.Z. Kelkar College, Mulund**

Members of Botany Department

Sr. No	Name of the Faculty	Designation and College	Signature
1.	Dr. Lal Sahab Yadav	Head & Associate Professor Smt. CHM College, Ulhasnagar	
2	Mr. Prashant Patil	Assistant Professor Smt. CHM College, Ulhasnagar	
3	Dr. Darshana Patil	Associate Professor Smt. CHM College, Ulhasnagar	
4	Dr. Lakshmi Girish	Associate Professor Smt. CHM College, Ulhasnagar	

Name & Signature of the BoS Chairperson: DR. LALSAHAB YADAV

Name & Signature of the Dean: Dr. NEENA ANAND

HSNC Board's

Smt. Chandibai Himathmal Mansukhani College

(Autonomous)

Affiliated to the University of Mumbai

Third Year B.Sc. (Botany)

Semester- V

Vertical-5

Title: Project: OJT

4 Credits

Course Code: CHMBOTV10

With effect from
Academic Year 2026-2027